

CHEMICAL ABSTRACTS

Vol. 15.

NOVEMBER 10, 1921

No. 21

1—APPARATUS

C. G. DERICK

Standardization of chemical apparatus. FREYMUTH. Berlin. *Z. angew. Chem.* 34, Aufsatzeil, 357-9(1921); 3 cuts.—F. enters a plea for the standardization of chem app., similar in character to the uniformity brought about in recent years in other scientific fields. Such app. as finds repeated use in various industries should be standardized without placing undue restrictions upon the specialized industries. In the chem. industries such app. as cooling coils, evaporators, connections, etc., as well as accessories should be standardized as to diam., length, size of thread, etc. In chemical labs., a uniformity of app. is even more necessary. A standardization of glass app., made of a glass of minimum alkali content, would eliminate useless expenditure and save quantities of cork and rubber materials. The use of only three sizes of tripod, corresponding to the microburner, Bunsen, and Teclu burners, is suggested. The principle of standardization should, if adopted, be so specified and applied, that it will not interfere with the development of new improvements and inventions. The advantages of such a system are: the establishment of a normal price, the simplification of manufacturing and storage problems, and the possibility for purchasers to secure accessories without delay.

THEO. F. BUEHRER

Modified laboratory apparatus. C. C. KIPLINGER. *J. Ind. Eng. Chem.* 13, 713(1921).—An improved *buret holder* is described consisting of an ordinary buret with a funnel-shaped top which serves as a support. A simple *ultramicroscope cell*, easily dissectable and of variable capacity, is described. K. advizes using head-set 'phones for *deig. the null point in electrometric work.*

DONALD E. SHARP

The repair of crystallized glass apparatus. HERBERT S. BAILEY. *J. Am. Chem. Soc.* 43, 1319(1921).—The crystn. will usually disappear if the nearly melted glass is held in a Na flame for a few seconds.

G. W. STRATTON

The use of acetylene in glass blowing. ALBERT S. COOLIDGE. *J. Am. Chem. Soc.* 43, 1319-20(1921).—For work with Pyrex glass C_2H_2 has a great advantage over coal gas because no accessory supply of O_2 is required. Compressed air gives a flame with C_2H_2 in which Pyrex glass can be worked easily and rapidly. For many operations, such as making joints, bulbs and constructions, the compressed air may be eliminated and a small torch used which is made on the same principle as the Bunsen burner. C_2H_2 is not suitable for soft glass because the flame is too hot and it is not possible to produce a smoky flame for warming up and annealing without filling the room with soot.

GEO. W. STRATTON

A combined extractor, reflux condenser, still, and autoclave. ALFRED T. SHOHL AND MATHILDE L. KOCH. *J. Ind. Eng. Chem.* 13, 819-20(1921).—1 cut. The app. consists of: (1) the main body, a Cu cylinder closed at one end, carrying a gage glass, charging funnel, and draw-off cock; (2) extn. trays of wire mesh or perforated metal; (3) autoclave attachment, fastened to the lid of the app., consisting of blow-off valve, safety-valve, and pressure gage; (4) stuffing-box to be used in place of the autoclave attachment when the app. is used as a still or extractor; (5) brass connecting tube

lined with block Sn; (6) block Sn, worm condenser surrounded by a cylindrical Cu water jacket. T. S. CARSWELL,

A liquid oxygen vaporizer. EDGAR A. GRIFFITHS. *Proc. Roy. Soc. (London)* 99A, 281-3(1921); 3 illus.—G. describes an arrangement for getting O to evap. at a fairly const. rate from a Dewar vessel, which in this case was used to carry liquid O for a breathing app. for mine rescue work. The idea is to allow the wall of the outer vessel to make contact with the wall of the inner vessel. A flexible Ag diaphragm is fixed to the base of the outer vessel and to the center of this is fixed a Cu block, which by means of a set-screw can be made to make contact with the inner vessel. The flow of O can be thus made to vary from $\frac{1}{2}$ l. to 12 l./min. H. BUTTLER

New apparatus for absorption of large quantities of gas. IGNACE MOSICKI. *Chimie et industrie* 2, 1303-16(1919).—A new type of absorbing unit to replace the old absorption tower is described as especially applicable to the absorption of oxides of N from dil. air mixts. such as occur in the arc fixation of N. The towers are very short and the absorbing bed or packing is made of small pieces of quartz 0.3 to 0.4 g. in wt., and in a typical installation packed to a depth of 60 cm. The towers themselves are made of earthenware. The gas passes into the upper chamber which is similar to the lower chamber in shape but inverted. This chamber provides space and time for the oxidation of the gases to be completed. The gas then passes through an earthenware tube to the bottom of the lower section and out into the packing of fine quartz packed between the earthenware tube and a concentric tube. This tube has an internal diam. of 44 cm. when that of the outside vessel is 60 cm. The gas inlet tube has an internal diam. of 10 cm. The absorbing liquid enters at the top of the lower section and after drenching the filling, flows out. Very good efficiencies were obtained with this app., M. claiming practically complete absorption. Details of several com. installations are given as well as a record of the exptl. development work.

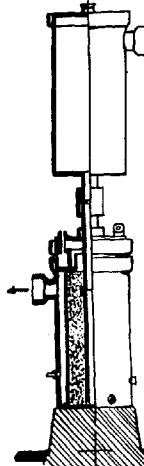
P. D. V. MANNING

New gas-analysis apparatus according to Aschoff. ANON. *Chem. Ztg.* 45, 582(1921); 1 cut.—A modified form of the Orsat app. in which the front bulb of the double pipet is open at the top and serves as a mantle for the absorption pipet which slips into it and is open at the bottom. The absorption pipet may thus be removed for cleaning without disturbing the soln., which remains in the double pipet. The latter is held in a clamp and may be adjusted vertically in order to make close connection with the capillary tube leading to the measuring buret. J. H. MOORE

Distillation apparatus. PAUL GROSS and ALEXANDER H. WRIGHT. *J. Ind. Eng. Chem.* 13, 701-3(1921).—A serviceable fractionating column may be made by sealing a Pyrex tube having several small bulbs sucked in its sides, to a distg. flask. Its efficiency is between that of the rod and disk, and pear types. G. and W. describe a method of protecting cork stoppers in fractionations, a micro-distg. flask, a receiver for vacuum fractionations and a simple modification of the McLeod gage. DONALD E. SHARP

Simple analytical extraction apparatus. H. WISLICENUS. *Zellstoff-chem. Abhandl.* 1, 71-2(1920).—The extn. thimble is fastened to an Al wire, which extends through the condenser. At the beginning of the extn., the thimble may be in the liquid and then drawn up at the close. C. J. WESS

An improved gas combustion furnace for use in organic analysis. THOMAS JOHN-



SON HEDLEY. Univ. Birmingham. *J. Chem. Soc.* 119, 1242-3(1921); 1 cut.—A portable furnace is constructed from a light steel frame carrying, in the channel formed by two angle-iron stays which brace the top of the frame, a number of trough-tiles and covers; the back and base of the frame is covered with sheets of uralite, and a hinged uralite screen in the front permits inspection of the flames. The endplates of the frame are slotted to receive the burner, which rests upon an adjustable spring arm; the burner consists of a tube partitioned in the center; each half is separately supplied with gas, and the gas supply to individual flames is controlled by cone-valves. T. S. C.

New rotary laboratory burner. W. VON HEYGENDORFF. *Z. angew. Chem.* 34, Aufsatzeil, 359-60(1921); 1 cut.—The rotary lab. burner described by Lockemann (*C. A.* 15, 2756) for use in ignitions, evapns. of concd. solns., and distn. of heavy liquids, is inadequate because (1) the rubber tube must rotate with the burner itself; (2) the movable burner support on the fly wheel tends to lessen the life of the rubber connection. The new improvement consists in letting the hollow vertical shaft of the pulley serve simultaneously as the gas supply pipe, and in a drum fastened horizontally at the head of the shaft which has connections for six burners arranged in the form of a spiral. As many burners as are needed for a given process are screwed on these threaded connections. The advantages of the construction are: (1) The rubber gas tube does not take part in the rotary motion of the burner; (2) each burner retains a rigid position; and (3) several burners may be used simultaneously. The burner is mounted on a heavy iron base and has a pulley for propulsion with a motor. THEO. F. BUEHRER

An improved type of filter press. C. D. BURCHENAL. *Chem. Met. Eng.* 25, 476-80(1921); 9 illus.—The improved filter (called the Duplex) differs from the old plate and frame filter in the fact that it has double inlets, double outlets, and a new method of supporting the filter-cloth. In the Duplex press the cloths are supported on a screen of wide-mesh double-crimp wire, which in turn is carried on widely spaced reinforcing ribs cast on the plate, so that ample space behind the cloth is provided for the fall of filtrate and for the easy access of wash water to the entire surface of the cloth. A double washing system is provided so that all cakes may be washed (in alternate directions, if desired) by the manipulation of a single valve. It is not necessary to close dripeocks on every alternate plate, as is usual in a washing type press. Drip cocks have been done away with as well as the open drip gutter; yet turbid filtrate from any one cloth can be detected and shut off without stopping the flow from a perfect cloth on the opposite side of the same plate.

H. BUTTLER

Studies in evaporator design. IV. W. L. BADGER AND E. M. BAKER. *Chem. Met. Eng.* 23, 569-74(1920); 6 illus.; cf. *C. A.* 15, 1641.—The authors give tables and curves for the vapor pressure of satd. $NaCl$ solns. from 78 to 107°; solv. of $NaCl$ in water from 50-110°; vapor pressure of $NaCl$ solns. from 50 to 100° contg. 0-36 g. $NaCl$ /100 g. H_2O ; and b. p. of $NaCl$ soln. at 760 mm. contg. from 0 to 40 g. $NaCl$ /100 g. H_2O . V. W. L. BADGER. *Ibid* 25, 459-63(1921); 5 figs.—The tendencies shown from the tests are that in horizontal tube evaporators the max. capacity occurs when the tubes are from $\frac{1}{2}$ to $\frac{2}{3}$ submerged. The max. capacity is reached at levels nearer the top of the heating surface as the app. temp. drop becomes smaller. The max. app. heat transmission coeff. is 105-108% of the heat transmission coeff. where the liquor level is at the top of the heating surface. The ratio of the corresponding heat transmission coeff. for two different temp. drops is const. for all levels above the optimum. H. B.

Improved MacMichael viscometer. F. WILBUR SHULENBERGER. *Paint, Oil and Chem. Rev.* 72, No. 7, 10, 12, 21-22(1921).—S. describes origin and construction of MacMichael viscometer (*C. A.* 14, 1065) as improved to overcome earlier objections due to variable dimensions, variation in speed and in the distance between the bob and the bottom of the cup. The cylindrical bob is recessed and this space filled with

air. With soft solids, the "viscosity" is dependent upon the speed; hence it is proposed to measure the viscosity at a speed of exactly 19.1 r. p. m. The speed is regulated by means of a governor and regulating screw. EUGENE C. BINGHAM

New Brown thermoelectric pyrometer. ANON. *Glassworker* 40, No. 49, 11 (1921); 2 illus.—A new method of automatic cold junction correction provides increased accuracy. In this pyrometer the extension or compensating leads are brought to the instrument. A Breguet spiral controls not only the springs and galvanometer directly, but also controls an index for zero setting on the scale itself. This last feature insures accuracy by indicating when the change in position of the zero has been caused by other conditions than a change in temp. of the cold junction. J. B. P.

Extensometer calibrating device. R. L. TEMPLIN. *Chem. Met. Eng.* 25, 248-51 (1921).—This device consists of a standard micrometer head mounted on a steel tube which slides over a steel rod mounted rigidly in a vertical position. Two weights of 1 or 2 lbs. each fastened to the ends of a cross arm serve to make the instrument positive. In making a calibration one clamps the extensometer to the rod, and moves the micrometer through known distances. The readings of the two instruments may then be plotted, and the av. error detd. DONALD E. SHARP

Arsenic double tubes. GEORG LOCKEMANN. *Z. angew. Chem.* 34, Aufsatzteil, 396 (1921).—A method is described whereby twice the number of arsenic detns. can be made with a single tube by the Lockemann modification of the Marsh method (*Z. angew. Chem.* 18, 416 (1905); see also *C. A.* 15, 1232). The tube has 3 sections about 5 mm. inside diam. and 5 cm. long sepd. by 2 constrictions of about the same length and about 1.2 mm. inside diam. The ends of the tube are terminated as usual. The mirror is deposited at the point where the tube is constricted and after a test has been made with each bulb the whole tube may be reversed and after a little easy glass working used for the other end for 2 more detns. The method applies particularly to small amts. of As.

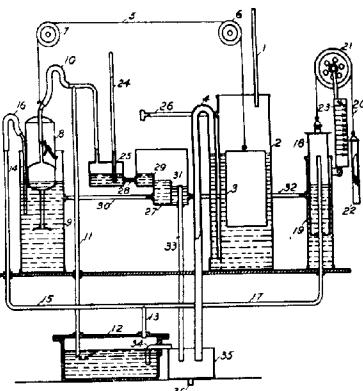
DONALD E. SHARP

A self-exciting mercury arc rectifier. ANON. *Wisconsin Engineer* 25, 91 (1921).—This type contains a small auxiliary rectifier within the power rectifier, which continues to operate even if load is shut off completely. F. H. HOTCHKISS

Extension of the range of the McLeod gage. A. H. PFUND. *Phys. Rev.* 18, 78-82 (1921); 2 cuts.—Since the sensibility of the McLeod gage is limited by the length of the trapped air column and by the difference in levels of the mercury columns, it is necessary, in the measurement of high vacua, to det. the pressure of the gas trapped in the capillary. A moderately high vacuum was produced by means of a Gaede mercury pump, and the highest vacuum was obtained by introducing a coconut charcoal trap, surrounded by liquid air, between the pump and gage. A "hot-wire" gage, consisting of a loop of tungsten wire sealed in at the top of the closed 2-mm. capillary, forms part of Wheatstone bridge, fitted with a portable galvanometer. The gage is calibrated by observing the deflections corresponding to pressures measured with the McLeod gage, a plot of these data being practically linear. Tables of data are given showing relation between length of air-column in closed capillary and pressures of gas respectively in closed capillary and in the system outside the gage. Since the ratio of compression of the gas is known, and the pressure of the trapped gas measured with the hot-wire gage, the true pressure is detd. The variation in the cooling effect with the character of the gas makes a calibration of the gage for each gas necessary. The results with air show an extension of the range of the McLeod gage from 5.26×10^{-6} mm. Hg, to 1.7×10^{-7} mm., the latter being the limit of the hot-wire gage. The ease of calibration of the hot-wire gage, the range of pressures which can be measured, and the magnitude of the lowest pressures detectable make the improvement very desirable. THEO. F. BUEHLER

The measurement of color (MEES) 2. Apparatus used in furnace control (FRION) 13. Plauson's method for preparing colloids (CHWALA) 13. Dehydration of transil oils (HAPGOON) 13. The saccharorefractometer (DILG) 11B.

Gas-analysis apparatus. W. L. DE BAUFRE. U. S. 1,384,603, July 12. The gas analysis app. as illustrated is operated by H_2O supplied continuously through pipe 1 to tank 2. As soon as the H_2O overflows the bend of siphon 4, it discharges rapidly from 2 through the siphon within 2. Chain 5 running over pulleys 6 and 7 is attached to float 3 at one end and to extractor bell 8 at the other end, so that 8 rises and falls in the liquid seal in tank 9 alternately with 3 in 2. As 8 falls, the gas mixt. previously drawn in during the up stroke is forced out through flexible tube 10 and pipe 11 into vessel 12, where it bubbles through the liquid absorbent reagent therein. The gas constituent to be measured is absorbed by this reagent. The remaining gas is discharged through pipe 13. While 8 is in its uppermost position, the gas in 12 is at atm. pressure by reason of the lower end of tube 14 being above the surface of the liquid seal in 9. As 8 descends, the gas remaining after bubbling through the reagent in 12 is at first discharged to the atm. through pipes 13 and 15, flexible connection 16 and tube 14. When the lower end of 14 penetrates the surface of the liquid seal in 9, the residual gas then flows through pipe 17 to measuring bell 18, which rises in the liquid seal in tank 19 in proportion to the vol. of the residual gas. The weight of 18 is counterbalanced by weight 22 attached to cord 20 passing over pulley 21. The percentage of residual gas or of the constituent removed by absorption in 12 is indicated on scale 23 by the highest position reached by 18. When 8 ascends, the gas in 18 remains entrapped until the lower end of 14 passes out of the liquid seal in 9. During the upward motion, a fresh sample of gas mixt. is drawn into 8 through pipe 24, bubbling through liquid seal in valve 25, the lower end of tube 11 being sealed by the liquid reagent in 12. When the H_2O in 2 reaches the highest point, a small amt. of it trickles through tube 26 and drops into the left-hand compartment of vessel 27, which is connected by tube 28 to 25. The overflow edge of partition 29 detd. the level of the liquid seal in 25, the excess H_2O draining into the middle compartment. The middle compartment of 27 is connected by tube 30 to 9, the level of the liquid seal therein being detd. by the upper edge of partition 31, over which the excess liquid runs into the right-hand compartment. Tube 32 joins the right-hand compartment of 27 with 19, the level of the liquid seal in the latter being detd. by the height of the upper edge of drain tube 33. The absorption of a constituent of the gas mixt. by the liquid reagent in 12 augments the vol. of the reagent. To eliminate the error consequent upon a change in vol. of the gas space above the reagent, tube 34 is arranged to extend near the bottom of 12 to be sealed by the liquid reagent therein, and project externally at about the height it is desired to maintain the surface of the liquid reagent. The excess reagent dropping from 34 is dild. by the H_2O from tube 33 and siphon 4 in vessel 35 and discharged through pipe 36 to waste.



Acetylene generator. A. F. HABENICHT. U. S. 1,383,464, July 5.

Gas-analyzing apparatus. O. RODHE. U. S. 1,385,150, July 19. The app. is especially adapted for detn. of CO or hydrocarbons. In front of the absorption and measuring vessels there are placed 2 furnaces for selective oxidation of CO and hydrocarbons with an absorption vessel contg. KOH between the furnaces.

Gas-purifier with centrifugal blast fan. C. BOURDON. U. S. 1,384,380, July 12.

Hardness-testing apparatus. A. MAIRE. U. S. 1,385,182, July 19. The app. comprises a diamond mounted on a pivoted arm for moving across an article to be tested under regulated variable pressures.

Apparatus for testing the hardness of materials. L. JOHNSON and H. BREARLEY. U. S. 1,384,389, July 12. The app. is constructed to test the material with a hardened steel ball under a regulated pressure.

2—GENERAL AND PHYSICAL CHEMISTRY

W. E. HENDERSON AND EDWARD MACK

Reagent chemicals. I. Proposed specifications for sulfuric, nitric and hydrochloric acids, and for ammonium hydroxide. W. D. COLLINS. *J. Ind. Eng. Chem.* 13, 735-7(1921).—Various tests are given for these reagents. The paper constitutes a supplement to the Report of the Committee on Guaranteed Reagents and Standard App. (cf. *J. Ind. Eng. Chem.* 13, 402(1921)).

H. JERMAIN CREIGHTON

Atomic and molecular volume at zero absolute. RICHARD LORENZ and W. HERZ. *Z. anorg. allgem. Chem.* 117, 267-70(1921).—A comparison of the calcd. at. and mol. vols. of the alkali halides at zero abs. has been made. For all these compds. the mol. vol. (MV_0) is less than the sum of the at. vols. ($\Sigma A V_0$) of the constituents of the compds. The "contraction" varies from 0.6% for NaI to 60.0% for CsF. For analogous Na, K and Cs compds., the contraction of the Cs compd. is always greatest and that of the Na compd. least; for the halides of an alkali metal, the contraction of the fluoride is greatest and that of the iodide least. In general, the contraction of the at. vol. to the mol. vol. is greater the more active the elements from which it is formed.

H. J. C.

Theory of valency. I. The behavior of decolorized magenta solutions. **II.** The configuration of benzene and the organic hydroxyl group. JULIUS GNHDZA. *Rev. chim.* 1, 17-23, 33-40(1921).—Org. substances of many widely varying types (amides, amines, amino acids, cyanogen compds., aldehydes, proteins, etc.) generate a red color with magenta solns. which have been decolorized by means of Na_2SO_3 or Mg metal, the development of the color usually taking place more easily when Mg is the decolorizing agent than when Na_2SO_3 is used. In certain instances a color is developed with Mg magenta solns. while no color is formed with sulfite-magenta solns. In order to explain these and similar facts, G. develops a theory of valency in which O is considered to possess, besides its two principal valencies, two stronger and two weaker subsidiary valencies, which, in certain circumstances, radiate "ponderable or imponderable" matter into the surrounding space and may bring about reoxidation of the decolorized soln. In the second paper, G. develops formulas for various compds. in accordance with this theory.

J. C. S.

Flow of gas at low pressures through capillary tubes. G. W. TODD. *Proc. Univ. Durham Phil. Soc.* 6, I, 8-15(1920); *Science Abstracts* 24A.—The laws for the flow of gas through tubes at ordinary pressures and at extremely low pressures, where the mean free path of the mols. approaches the dimensions of the measuring app., are very different, and are inadequate to express the facts for intermediate pressures. Expts. are described having for their object the finding of an empirical expression for the flow of a gas through a tube which would represent the facts for all pressures. A

large number of readings are tabulated for air and H with capillary tubes of various ascertained dimensions. These results are plotted, and it is found that the viscosity of air flowing along a tube of circular cross-section is a function of the product of mean pressure into the diam. The form of the function is discussed, and the relationships arrived at are compared with Knudsen's formula.

H. G.

Measuring gases containing water vapor. THOMAS G. ESTEP. Carnegie Inst. Techn. Chem. Met. Eng. 25, 329-31 (1921).—It is pointed out that in the accurate measurement of large quantities of gases in the various industries, a detn. of d. is necessary because the gases are satd. with H_2O vapor. Velocity formulas modified to use sp. gr. values have been detd. graphically. The detn. of the vol. from the velocity of the gas is treated, and the procedure for partially satd. gases is discussed.

H. J. C.

The velocity of flocculation of selenium sol. II. Flocculation by means of barium chloride. H. R. KRUYT AND A. E. VAN ARKEL. Van't Hoff Lab., Utrecht. *Rec. trav. chim.* 40, 169-91 (1921).—In the preceding paper (*C. A.* 15, 1436) the slow and rapid flocculation of Se sol by means of KCl at various concns. was studied. In this paper similar expts. with $BaCl_2$ are described. The undiluted sol behaves toward $BaCl_2$ essentially the same as it does toward KCl. The variation of the velocity of flocculation with the concn. of the electrolyte is more gradual with $BaCl_2$ than with KCl. Contrary to what was observed with KCl there is a zone of slow flocculation where Smoluchowski's theory is verified. A sharp break such as was observed in the flocculation by KCl was shown by $BaCl_2$ only at a concn. of 2 millimols. With a $BaCl_2$ concn. of 3 millimols. there is a sharp diminution of T (time), which K. and v. A. say cannot be explained as due to a reversal of adsorption. The differences in the behavior of $BaCl_2$ and KCl become more striking as the diln. of the sol is increased; thus at concns. of 2 to 100 millimols. $BaCl_2$, the values of T are nearly const. for intervals from 17 to 3000 secs. For the very dil. sol von Smoluchowski's theory was confirmed for a wide range of concns. The velocity of flocculation, when a given amt. of $BaCl_2$ acts upon various concns. of the sol, is not proportional to the concn. in the case of slow flocculation. The kinetics of the process of flocculation will be clearer if not only the velocity of flocculation but also the value of the charge carried by the sol particles is known. Then methods and data for these detns. are given. The addition of small amts. of KCl scarcely changes the potential of the surface of contact. If NH_2NH_2 is added the contact potential is raised, the result of which is that NH_2NH_2 increases the stability of the colloid. On adding $BaCl_2$ the contact potential falls rapidly and for 40 millimols. the discharge is nearly complete, which agrees with the short time required for the reduction of the original concn. by one half. Detns. could not be made at 100 millimols. The discharge takes place still more rapidly under the influence of luteocobalt chloride, $(NH_3)_6CoCl_6$. In this case a change of sign of the charge was observed. With additions of $Th(NO_3)_4$ there is also a change of sign of the charge, but in this case the products of hydrolysis of the $Th(NO_3)_4$ play a considerable rôle. The addition of KOH raised the potential of the contact surface and in this case it is the OH^- ions that have this effect, as was expected. When the results of the expts. are compared with the theory of the velocity of flocculation there are 3 points of view in which they are in disagreement. (1) The highest value observed for R/a is considerably above the minimum value that the theory admits in the case of rapid flocculation. (2) In these cases there is a diminution in the value of T , which ought to remain constant according to the theory. (3) But the most important deviation is the strong increase of the value of T , which manifests itself especially with the undil. sol when one ppts. it with KCl. These disagreements are discussed in detail without arriving at any conclusions as to the causes. Somewhat similar deviations are ob-

served with Au. The comparison of the sols of Se and Au led to a discussion of the relation between the limit surface potential, the concn. of the electrolyte and the probability of adhesion.

E. J. WITZEMANN

Sols with non-spherical particles. H. ZOCHER. *Z. physik. Chem.* **98**, 293-337 (1921).—The phenomenon of streaming double refraction with V_2O_5 -sols observed by Diesselhorst, Freundlich and Leonhardt (*C. A.* **10**, 2662) has also been established with the following sols: soap solns., clay suspensions, AgCNO, benzopurpurin, benzobrown, primuline, Na alizarinsulfonate, alizarin, *p*-azoxypheophytol, *p*-azoxyanisole, anthracene, cerasin orange and aniline blue. Some observations have been made of the spacial distribution of double refraction in moving sols. On allowing the sol to flow between crossed Nicols in the direction of the axis joining the Nicols, dark crosses are obtained which are analogous to the figures given by a uni-axial crystal with convergent light. This phenomenon can be used as a method for the recognition of double refraction and pleochroism in sols in motion and for the detn. of their character. The distortion of the crosses into vortices towards the direction of polarization demonstrates that the direction of flow does not necessarily conform with one of the directions of primary vibration (*Hauptschwingungsrichtungen*) of the light. The coincidence of the cross with the direction of polarization, in the case of aged V_2O_5 -sols and soap solns., is traced back to the flexibility of the particles causing double refraction. The sign of the double refraction in soap solns. varies with their age and concn. This variation in sign, which has also been observed by Cotton and Mouton (*C. A.* **1**, 2966) with $Fe(OH)_3$ -sols in a magnetic field, is probably due to the fact that rod-shaped colloidal particles arrange themselves with their symmetrical axes in the direction of the lines of flow (or of the lines of force), while laminar particles arrange themselves with their symmetrical axes at right angles to these lines. With growth of crystals or colloids (ageing) there is a transition from the rod-shaped to the laminar particle. On pouring an alc. soln. of aniline blue into H_2O , the streaming sol exhibits marked negative double refraction in the red, negative pleochroism in the orange to green, and positive double refraction in the blue. This anomalous optical behavior results in the formation of anomalous interference colors. Optical anisotropy produced by a magnetic field has opposite signs, *i. e.*, the colloidal particles arrange themselves at right angles to the lines of force, and parallel to the elec. lines of force (current lines). On heating, the negative double refraction of benzopurpurin disappears, but returns on the addition of electrolyte to the sol after cooling. Benzopurpurin sols produced by peptization do not exhibit double refraction, provided coagulation occurs rapidly and the initial sol is optically isotropic. On acidifying, the birefringent red are transformed into the birefringent blue sols. The marked pleochroism of benzopurpurin sols always has a negative sign, and the colloidal particles exhibit diamagnetic behavior. The double refraction observed in V_2O_5 -sols disappears more slowly the greater their age and concn. Both highly concd. and aged V_2O_5 -sols and highly concd. benzopurpurin solns. which are poor in electrolyte exhibit marked double refraction of the same duration observed in cryst. liquids. It is pointed out that the growth of nonspherical colloidal particles is due not to crystn., but to a rearrangement of these particles in a parallel position.

H. JERMAIN CREIGTON

Gelatinization of starch in cold water in presence of alkalies or neutral salts. A. REYCHLER. *Bull. soc. chim. Belg.* **29**, 118-22 (1920).—Starch grains may be rapidly gelatinized at the ordinary temp. by solns. of KOH or NaOH, but not by NH₄OH. By using a 0.75% soln. of KOH the process may be made sufficiently slow for microscopical observation. Many neutral salts also produce gelatinization. Among the least active are Na and Ca chlorides, while NH₄Cl, SnCl₄, HgCl₄, Pb(NO₃)₂, and Na benzoate are more active, but even in concd. solns. they act more slowly than 0.75% KOH

soln. The following substances at the concns. stated have the same gelatinizing power as 0.75% KOH soln.—NaOH at 0.58%, KI at 26–28%, NH₄NO₃ at 30–35%, HgNO₃ at 29%, KCNS at 12–15%, and chloral hydrate at 55%. The mechanism of the gelatinization process is discussed from the botanical standpoint. J. S. C. I.

Surface extension of soluble or volatile compounds. A. MARCELIN. *Compt. rend.* **173**, 79–82(1921).—Oleic acid is known to spread spontaneously over H₂O, the thickness of the film being assumed to be monomol. This property is shown by M. to be a general one. The solid spreading radially from a center will repel particles of talc powdered on the H₂O surface. The radius is limited by the equilibrium between the solv. or volatility and the tendency to spread from the central source. By the expedient of using visible moving particles, the rate of increase in area is measured. From the vol. of compd. in soln. or volatilized, the thickness of film can be calcd. The following values in $\mu\mu$ were found: camphor 0.65–0.1; menthol 0.56–0.1; isobutylcamphor 0.4–0.2. Solid C₆H₆ was found to act similarly. Camphor spreads over H₂O covered by a film of oleic acid. If the film of camphor on the oleic acid is decreased in diam. by a reduction in the total surface of the acid, there is a critical point where the camphor assumes the state of a drop of oleic acid which can spread no further because the H₂O is already covered with a satd. layer of acid. The pressure of surface satn. of the camphor, *i. e.*, the surface pressure of the oleic acid opposing the extension of the camphor, was measured by finding the relation $P=f(S)$ where the surface pressure of a known wt. of oleic acid is a function of the occupied area. The following values were obtained for several compds. in dynes-cm.: dimethylpyrrolidone 31.5; dimethylcampholamine 29.7; isobutylcamphor 20.4; menthol 20.4; *p*-MeC₆H₄NH₂ 16.7; camphor 13.0; thymol 12.1; borneol 11.1; methyl propylcamphocarbonate 9.4; benzalcamphor 0.94. C. C. DAVIS

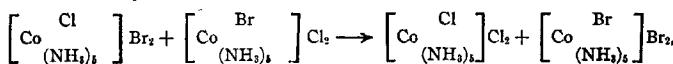
The existence of compounds in liquid mixtures. W. P. JORISSEN. Univ. Leyden. *Rec. trav. chim.* **40**, 281–4(1921).—Recently Smits, *et al.* (*C. A.* **15**, 3238) reported results on viscosity detns. of aq. solns. of FeCl₃ and of H₂SO₄ and found that as the concn. of the solns. increases the viscosity passes through a max. and then a minimum and then continues to rise to the point where the expts. were stopped. They explain this course of the curve by stating that increasing concn. of hydrate causes a diminution in viscosity. As a matter of fact J. observes under these conditions it shows a max., but when the concn. of FeCl₃ or SO₄²⁻ increases still more it is necessary that by the relative diminution of the hydrate concn. the viscosity curve should fall. In support of these statements J. cites more complete investigations of the same subject (Knietsch, *Ber.* **34**, 4102(1901); Kremann, Ehrlich (*Sitzb. Akad. Wiss., Wien* **116**, IIb, 789(1907)); Dunstan and Wilson (*C. A.* **1**, 956; **3**, 737). It is true that the system HNO₃–H₂O (Küster, Kremann, *Z. anorg. Chem.* **41**, 19(1904)) shows no minimum but perhaps the system should be considered N₂O₅–H₂O and the solns. of N₂O₅ in HNO₃ examd. also. The question of the existence of hydrates in aq. soln. is part of the general problem of combinations in liquid mixts. Thus the system *o*-O₂NC₆H₄Me–EtOH (Wagner, *Z. physik. Chem.* **46**, 873(1903)) shows a max. and minimum. The f. p. curve of this system would aid in checking up on Smits' viewpoint. Other studies of the viscosity and f. p. curve, particularly of liquid mixts. of org. substances, are suggested and are in part completed as a part of a study of the mechanism of the beginning of a reaction (cf. *Chem. Weekblad* **5**, 725(1908); **6**, 931(1909); **9**, 58(1912) and *C. A.* **10**, 417; **12**, 2480; **15**, 475. E. J. WIRZEMANN

Precipitations. SVEN ODÉN. Stockholm. *Arkiv Kemi Mineral. Geol.* **7**, No. 26, 92 pp.—A study of the primary structure of BaSO₄ crystals; influence of concn.; rate of mixing of reacting substances; influence of nature of reagents; influence of temp.; recrystn.; comparison of primary structure of Ca, Sr and Ba sulfates; secondary structure of BaSO₄ crystals; rate of aggregation; influence of addition of electrolyte

on size of crystals; disintegration and aggregation under influence of added electrolyte; irreversible secondary aggregations; and the absorption power of BaSO_4 . The article gives a minute description with line drawings and photographic reproductions of app. used for detg. the rate of settling of crystals in various liquids, from which data the size of crystals is calcd. and surface exposed detd. Numerous graphs and tables of exptl. results are given. Mathematical calcns. show agreement between theoretical calcns. and exptl. results.

P. M. GLASOE

Studies on chemical affinity. XIII. The transformation affinity in systems of solid salts. J. N. BRØNSTED. Copenhagen. *Z. physik. Chem.* 98, 239-49 (1921); cf. *C. A.* 13, 393.—Two general principles have been described for the measurement of transformation affinities in salt systems: the 1st, for easily sol. salts, depending on the detn. of the vapor-pressure curves between triple points; the 2nd, for slightly sol. salts, depending upon the detn. of the soly. product, P , of the slightly sol. salt in a concd. soln. of another salt. The latter method has been employed to det. the transformation affinity of



the affinity being calcd. by the equation $A = RT \log \frac{(P_{[\text{Cl}]\text{Br}} \cdot P_{[\text{Br}]\text{Cl}})}{(P_{[\text{Cl}]\text{Cl}_2} \cdot P_{[\text{Br}]\text{Br}_2})} = RT \log \pi$,

where $[\text{Cl}] = \text{Co} \begin{array}{c} \text{Cl} \\ | \\ (\text{NH}_3)_5 \end{array}$ and $[\text{Br}] = \text{Co} \begin{array}{c} \text{Br} \\ | \\ (\text{NH}_3)_5 \end{array}$. The mean of the values obtained

for π in different salt solns. is 3.16, from which it follows that at $T = 273^\circ$ abs. the transformation affinity, A , is 621 cal.

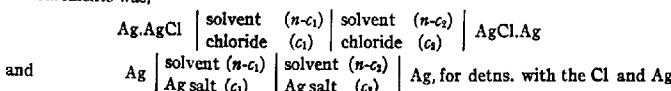
H. JERMAIN CREIGHTON

Formation and stability of modifications of polymorphous substances below their transition temperature. R. BRAUNS. *Centr. Mineral. Geol.* 1921, 225-9.—The metastable forms of S including monoclinic prismatic S, which form when molten S crystallizes, can be kept unchanged for years between a microscope slide and cover-glass. Other metastable crystals which can be obtained and preserved are the yellow form of HgI_2 , which is stable only for a few hrs., and the rhombohedral form of KNO_3 , which may be kept for years. These substances when crystg. appear to follow Ostwald's step rule, that when a change of form occurs, the form appearing is that which is accompanied by the smallest loss of free energy. Doubly refracting cubic crystals of boracite found in salt deposits indicate that the boracite first crystd. in the cubic form far below its transition point, 265° . Mügge's conclusion that the temp. rose locally to so high a point as this during crystn. is not justified; more probably this substance also follows Ostwald's rule, and separates first in the metastable cubic form. J. C. S.

Theory of the equation of states. II. MARIO BASTO WAGNER. Lisbon. *Z. physik. Chem.* 98, 244-51 (1921); cf. *C. A.* 15, 968.—A mathematical paper dealing with the theory of the heat of vaporization and the theory of internal pressure. H. J. C.

Applicability of the gas laws to strong electrolytes. II. J. N. BRØNSTED. *Kgl. Danske Videnskab. Selskab., Math.-fys. Medd.* 3, No. 9, 21 pp. (1920); cf. *C. A.* 14, 2113.—In the present investigations e. m. f. detns. with an electrolyte dissolved in a concd. soln. of another have been carried out for the purpose of extending results previously obtained, and partly to procure information on the question of complete or incomplete dissociation. A modified form of the electrometric method previously employed was used. The principal feature of this modification consists in the use of a streaming electrode, the electrolyte being allowed to flow through the solid (finely powdered) electrode of AgCl . The app. was constructed so as to permit variation in the velocity of the

streaming electrolyte through the electrode. The type of cells used for the activity measurements was,



ions, resp. The solns. employed as solvents in the cells were 2 molal KNO_3 , NaNO_3 and MgSO_4 and 1 molal MgSO_4 . The almost complete agreement between the exptl. and calcd. e. m. f. values of the cells afford strong support to the theory that the simple gas laws are valid for ions present in salt solns., the concns. of which are large in comparison with that of the ions concerned. The range of the concns. within which the law applies extends up to 0.2 molal, or to probably even higher concns., in mixts. of uni-univalent salts. This indicates the same degree of dissociation over this concn. range, and therefore may be regarded as evidence in support of the theory of complete dissociation. The law begins to fail, however, in the neighborhood of 0.05 molal mixts. of MgSO_4 and MgCl_2 . This behavior is attributed to a change in the dissolving power of the solvent rather than to incomplete dissociation. All equil., including strong and weak electrolytes, are highly simplified when allowed to be established in concd. salt soln. as solvent instead of in H_2O . Expts. were also carried out covering solns. as dilute as 0.1 molal, for the purpose of detg. whether the change in the molal fraction x , over the whole range in concn. from $x=0$ to $x=1$, corresponds to a const. activity coeff. or to an activity coeff. changing in conformity with the dissolving power of the solvent. It has been found, in agreement with the results obtained by Loomis, Essex and Meacham (*C. A.* 11, 2060), that slight changes in the activity coeff. do occur with varying concns., thus indicating that the ions of the varying solvent are acted upon differently from extraneous ions of small const. concn.

H. JERMAIN CREIGHTON

A calculator for converting gas-chain voltage into equivalent $C_{\text{H}}+$ or ρ_{H} values. PAUL E. KLOPSTEG. *Science* 54, 153-4 (1921).—A description of an instrument of the slide-rule pattern, with which the operation can be readily performed. The slide-rule can be used equally well when the reference electrode, instead of being the usual calomel half-cell, is a H electrode of known potential relative to the standard soln. in which it is immersed. Settings with the slide-rule are possible to an accuracy of ± 0.5 milli-v.

H. JERMAIN CREIGHTON

The energy of oils, fats, waxes and related solid substances. A. KÜNKLER. Heidelberg-Rorhbach. *Seifensieder-Ztg.* 48, 542 (1921).—An attempt is mad. to consider as an independent form of energy or motion the familiar phenomena observed when paraffin, wax, pitch, etc., become electrified by friction and are brought near a suspended thread, paper or needle.

P. ESCHER

Relation between electrical resistance and tension in bismuth. E. ZAVATTIERO. *Atti accad. Lincei* 29, I, 48-54 (1920); *Science Abstracts* 24A, 446.—The exptl. arrangement and method of conducting observations are described and the results obtained are given. During the process of traction the elec. resistance of the wire diminishes with increase of the load; for small loads proportionally to the deformation, with large loads less rapidly. Under the action of a const. tension in proximity to the limit of fracture, the sp. resistance of the Bi gradually increases. The action of a magnetic field is also considered.

H. G.

Thermal analogy of the Oersted-Ampère effect and the electronic theory of metals. O. M. CORBINO. *Atti accad. Lincei* 29, II, 335-9 (1920); *Science Abstracts* 24A, 372.—If there exists a thermal analogy of the Oersted-effect it ought to be possible to show that a disk through which flows a radial current of heat will exhibit a tendency to rotate when subjected to the action of a magnetic field at right angles to its plane. The

object of the present paper is to consider the probability of being able to demonstrate such an effect and to investigate the question in its relation to the electronic theory of cond. of metals.

H. G.

Electronic theory of conductivity of metals in a magnetic field. O. M. CORRINO. *Atti accad. Lincei* 29, 282-5(1920); *Science Abstracts* 24A, 372.—It is concluded that the phenomena which occur during the passage of heat or of electricity in metals cannot be satisfactorily explained by a theory which takes count of only one kind of electron; in all this field of phenomena the dualistic theory has the advantage. On this account, although the existence of free positive electrons has not yet been proved, they constitute provisionally an indispensable element in any complete explanation of the phenomena of metallic cond. and of the effects of the magnetic field.

H. G.

Galvanomagnetic effects. A. SELLERIO. *Nuovo cimento* 20, 51-94(1920); *Science Abstracts* 24A, 372-3.—The phenomena presented by Bi in a galvanomagnetic field are found to be analyzable into 3 components: (a) The ordinary Hall-effect, transverse and proportional to H ; (b) an axial effect, proportional to H and directed along the lines of force; and (c) a disturbing effect proportional to H^2 , with angular relations of the order of a harmonic of the two former. To the last mentioned the known asymmetry of the Hall-effect is to be traced.

H. G.

The measurement of color. C. E. K. MEES. *J. Ind. Eng. Chem.* 13, 729-31(1921).—The importance of color measurements in the chem. industries is briefly discussed, and the measurement of sensation of color and that of the stimulus produced by this sensation are differentiated. The spectro scope, spectrophotometer, colorimeter, monochromatic analyzer, trichromatic analyzer and their uses are briefly described.

H. JERMAIN CREIGHTON

Heats of combustion and formation of nitro compounds (GARNER, ABERNETHY) 24. Influence of a magnetic field on the dissociation of excited molecules (FRANCK, GROTRIAN) 3. Contact electricity in high vacuum (COERN, LORZ) 3. Plaiston's method for preparing colloids (CHWALA) 13. Thermodynamics and its application to the chemical industry (URBAIN) 13. Velocity of hydrolysis of ethyl orthoformate (SKRABAL, RINGER) 10. The catalytic oxidation of some alcohols under the influence of photoactive ketones (BÖRSEKEN) 10. The thermal expansion of aluminum-zinc alloys (SCHULZE) 9. Liquid crystals. V. (RIWLIN) 3. Molecular motion and the laws of thermal radiation (BRILL, OUIN) 3. The hardness of solid solutions (ROSENHAIN) 9.

BARY, P.: *Les colloides: Leurs gels et leurs solutions.* Paris: Dunod. 47 and 49 Grands-Augustins. 508 pp. 50 fr. For review see *Rev. prod. chim.* 24, 538 (1921).

3—SUBATOMIC PHENOMENA AND RADIOCHEMISTRY

GERALD L. WENDT

Recent advances in science. Astronomy. H. SPENCER-JONES. *Science Progress* 16, 1-6(1921).—Ionization in stellar atmospheres is discussed. Cf. *C. A.* 15, 1252. JOSEPH S. HEPBURN

Atomic energy and radiation from the sun. F. H. LORING. *Chem. News* 122, 219-20(1921).—Saha's papers on ionization in the sun (*C. A.* 15, 468, 799) afford some data as to the elements present therein. Rutherford and Chadwick's expts. on breaking up atoms by bombarding with α -particles (*C. A.* 15, 2238), the large mass of the radioactive elements and the enormous mass of the sun seem to indicate that during contraction of the sun's central mass the at. nuclei are forced so close together that due

to interference of the active parts of the atoms more or less radioactive disintegration takes place. This should result in ionization of the atoms in the photo-sphere with resulting radiation. Those elements which Rutherford has found to give rise to long range H atoms are generally those absent in the sun. Only the more resistant ones remain except possibly with the exception of one or two very resistant elements.

F. O. A.

Types of valence. IRVING LANGMUIR. *Science* 54, 59-67(1921).—Three postulates are made. They are consistent with those previously proposed by L in the Lewis-Langmuir theory of at. structure. This new method of deriving the relation of structure of the atom and types of valence is very much simpler. New ideas of the relationship between the different types of valence are brought out. Compds. are classified according to the types of valence of their atoms into (1) complete compds., (2) incomplete compds., (3) exceptional cases. The theory accounts for the structure of the first two classes of compds. This is an important paper in the development of the at. structure theory.

L. D. R.

The existence of helium nuclei in the nuclei of radioactive elements. F. BRÖSSLERA. *Rev. chim.* 1, 42-8, 74-80(1921).—The mass of a He nucleus is less than that of the 4 H nuclei, from which it may be supposed to be formed, by an amt. $\Delta m = 4 \times 1.0077 - 4.002 = 0.029$. This corresponds with a loss of energy during the condensation of the H nuclei of $0.029c^2$ per g.-atom of He formed (c =velocity of light). Consequently, it is unnecessary to suppose that He nuclei pre-exist in the nuclei of radioactive elements in order to account for the kinetic energy possessed by α -particles, for part of the energy liberated during the formation of He nuclei within the atom from pre-existing H nuclei might be utilized in detaching the α -particles so formed and imparting to them their momentum.

J. C. S.

A rapid method of measuring the leakage current characteristic of an electroscope in the determination of radium emanation. P. LOISEL. *Compt. rend.* 172, 1484-6 (1920).—In the use of an electroscope in the detn. of Ra emanation it is necessary to correct the observed current of ionization for the leakage current in the electroscope due to the leak of the current along the insulators and the ionization of the air by penetrating radiations. This leakage current may vary from time to time. In the detn. of Ra emanation by the ordinary method it is customary to measure this leakage current at the beginning and use this value to calc. the max. current from the observed current which was measured 3 hrs. later. Since the leakage may change with the time this method is open to serious error. A method is described by which the leakage current can be calcd. at the moment at which the max. current is measured. The max. current is due in part to the ionization produced by the radiations characteristic of the radium emanation and in part to the radiations from radium A, B and C in equil. The value of the current due to the latter cause is about 57% of the total ionization current independent of the leak of the electroscope. It is known that after long exposures the α -radiations decrease to one-half their value in 15 min. Let the intensity of the ionization current be measured 3 hrs. after the introduction of the emanation into the condenser. Then $I_m = I_1 - I_d$ where I_m =max. current, I_1 =current measured in the electroscope and I_d =the leakage current. Now rapidly evacuate the condenser and fill it with inactive air. At the start the observed current is 0.57 I_m but it sinks to one-half its value in 15 min. Hence $0.285 I_m = I_2 - I_d$, in which I_2 is the current measured. Dividing equation (1) by equation (2) $0.285 (I_1 - I_d) = I_2 - I_d$ and $I_d = (I_1 - 0.285 I_2) / (1 - 0.285)$. This method assumes that during the short time of the expt. the leakage current does not change.

A. W. SMITH

The production of the saturation current in a cylindrical condenser by ionization from radium emanation in equilibrium with its disintegration products. FRANZ BRÖSS-

LER. *Sitzb. Akad. Wiss. Wein*, IIa, 129, 47-57 (1920).—A study was made of the relation between the current and the voltage in a cylindrical condenser filled with Ra emanation in equil. with its disintegration products (Ra-A to Ra-C). The method of measurement was that used by St. Meyer and Hess except that a cylindrical condenser replaced the half spherical condenser used by them. After the condenser was filled with Ra emanation a difference of potential of about 460 volts was applied to the condenser in such a way that the central electrode was positive. After equil. conditions had been reached the voltage-current curve was detd. This required about 1 hr. and during this time the decrease of the Ra emanation through disintegration amounted to about 34%. At the end of these observations the emanation was rapidly removed and the voltage-current curve for the active deposit was detd. The interval over which the current was studied was between 10 and 210 electrostatic units. Since the ordinary method of graphical extrapolation is not sufficiently exact for such cases the satn. value of the current was obtained from the exponential equation, $i = J(1 - e^{-kE})$, where i is the current for the voltage E , J is the satn. current and k is a const. Although there is present in the condenser both a surface and a vol. ionization this equation was found to express the relation between the observed current and difference of potential with sufficient accuracy. The satn. value of the current calcd. from this equation agrees well with the observed value. A simple relation between the satn. current and the const. k is developed. To make this relation which states that $Jk^2 = K$ expresses the facts with sufficient accuracy it is necessary to assume two values of the constant K . One of these values is for $J < 100$ and the other for $J > 100$. Where the conditions of observations used in these expts. are duplicated it is possible by means of these equations to calc. the satn. current from a single observation on the current and voltage. A method is also outlined by which the measurement of the current-voltage curve for the active deposit as well as for the radium emanation alone can be carried out.

A. W. SMITH

The distribution of the active deposit of radium in an electric field. ANNA GÄBLER. *Sitzb. Akad. Wiss. Wein*, Abt. IIa, 129, 201-20 (1920).—All previous investigations about the active deposit of radium in an elec. field have considered only the distribution of the radioactive matter on the electrodes. There are no data on the total distribution of the radioactive deposit as detd. by the quantity of Ra emanation, the strength of the elec. field and the size and form of the containing vessel. These observations were made on a cylindrical brass vessel with a cylindrical rod on the axis for the central electrode. The vessel was exhausted and then filled with Ra emanation mixed with air. When radioactive equil. had been reached, observations were made on the activity of the emanation in the vessel. The emanation was then expelled and the sum of the active deposits on the vessel and on the central electrode was detd. Then the active deposit on the central electrode alone was measured. From these detns. together with a knowledge of the rate of decay of Ra C, the active deposit at the time at which the emanation was expelled from the vessel, was calcd. Observations were made for quantities of emanation between 1 and 24 millicuries and for elec. fields between 0 and 460 volts. per cm. When there is a const. difference of potential between the vessel and the central electrode the total deposit and also that on the central electrode is a function of the quantity of emanation introduced into the vessel. The total quantity of active deposit varies rapidly with an increase in the quantity of emanation and soon reaches a const. value. The curve showing the dependence of the deposit on the quantity of emanation is the same for a field of 22 v. per cm. and for a field of 46 v. per cm. The amt. of active deposit on the central electrode decreases with the quantity of emanation and this decrease is less for large than for small elec. fields. The total deposit is independent of the elec. field. The quantity on the central electrode increases

and that on the vessel decreases with the elec. field. There is a linear relation between these quantities and the elec. field in each case. The independence of the total quantity on the elec. field shows that the elec. wind has no influence on the total quantity. In the absence of an elec. field the deposit on the central electrode is detd. by the characteristic motions of the emanation as a gas. The density of the ions in this case is the same at the central electrode and on the wall of the vessel. In the large vessel the amt. deposited on the central electrode was the same whether it was used as a cathode or as an anode. In the small vessel for an elec. field of 220 v. per cm. the activity of the central electrode was 20% of the total when the central electrode was the anode and 45% of the total when the central electrode was the cathode. Some observations were made with a glass vessel instead of the small metal cylinder. The results are in agreement with the observations made on the large metal vessel. A. W. SMITH

Corpuscular spectra of the elements. M. DE BROGLIE. *Compt. rend.* 172, 527-9 (1921).—B. has shown (*C. A.* 15, 1458) that the general features of X-ray spectra are reproduced in the magnetic-velocity spectra of electrons emitted by elements exposed to X-rays. These spectra are obtained by a method similar to that of Robinson and Rawlinson (*C. A.* 8, 3754), a line source of electrons being obtained by placing the substances to be examd. (oxides, salts, etc.) in a narrow groove in a disc of hard-rubber or Al. A Coolidge tube is used and an exposure of 1 hr. gives satisfactory photographs. An element exposed to rays of sufficiently high frequency emits K fluorescent radiation and electrons, the velocity spectrum of which shows (beginning on the side of small velocities) a strong line corresponding to the α -doublet, a weaker line corresponding to the β -line, and a band sharply defined on both sides and showing 2 or 3 sudden fluctuations of intensity near the high frequency side. The electron velocities are related to the corresponding X-ray frequencies by the *quantum* relation within a few %, and the discrepancy is smaller if the energy required to remove the electron from the atom, calcd. on Bohr's theory, is added to the observed kinetic energy. The *band* described above requires no such correction.

HARRY CLARK

Bohr's model of the atom and corpuscular spectra. MAURICE DE BROGLIE AND LOUIS DE BROGLIE. *Compt. rend.* 172, 746-8 (1921); cf. preceding abstr.—The theory of magnetic-velocity spectra of electrons emitted by matter exposed to X-rays is discussed. The kinetic energy of an emitted electron is assumed to be $h\nu - W$, where h is Planck's const., ν is the frequency of the X-ray, and W is the work required to extract the electron from the atom. ν may refer to the primary X-ray or the various secondary fluorescent rays from the exposed substance (some of which are reabsorbed). According to Bohr's theory $W = h\nu_A$ where ν_A is the frequency of either the K, L, or M characteristic absorption discontinuity. The velocity spectrum should therefore show a line corresponding to each expression of the form $h(\nu - \nu_A)$ having a positive value. The 3 lines corresponding to the combinations of $\nu_{K\alpha}$, $\nu_{K\beta}$, ν_L , and ν_M have been found experimentally. Note that $\nu_{K\alpha} - \nu_M = \nu_{K\beta} - \nu_L$. The case of one element covered with a thin layer of another element is discussed and some exptl. evidence described.

HARRY CLARK

Corpuscular spectra; the laws of photo-electric emission for high frequencies. MAURICE DE BROGLIE. *Compt. rend.* 172, 806-7 (1921); cf. 2 preceding abstrs.—Expts. on many elements from $N = 29$ to $N = 70$ (list given) show that electrons are emitted with energies corresponding to all expressions of the form $h(\nu - \nu_A)$ the values of which are positive. In the general statement ν_A includes ν_K , ν_L , ν_M . ν_L is taken equal to ν_{B_1} in cases where it has not been directly measured. The fact that there are several L absorption frequencies is not mentioned. The theory of one element covered with a thin layer of another element is verified experimentally. The spectrum "lines" are really narrow bands fairly sharp on the high velocity side. There is an emission band

starting fairly sharply on the small velocity side at a value corresponding to the K absorption frequency of the radiated element which is not explained by the theory. Velocity spectra may be used to study X-ray spectra without crystals, *i. e.*, without a long wave-length limit.

HARRY CLARK

Anode rays of beryllium. G. P. THOMSON. Cavendish Lab., Cambridge. *Nature* 107, 395(1921).—When the method of anode ray analysis as used by Aston (*C. A.* 14, 3578) to det. the isotopes of Li was applied to Be, a well marked parabola was found corresponding to a single charge and an at. wt. 9.0 ± 0.1 (Na=23). No second line was observed which could with certainty be attributed to Be but the parabola at 9.0 was not so strong as that at 7.0 for Li and it is doubtful if one of $1/10$ the intensity could be observed. No indication was found which would suggest that the atom of Be can lose 2 electrons under the conditions of these expts. W. H. ROSS

Potential of excitation for electrons in a mixture of the vapors of sodium and potassium. A. CAMPETTI. *Atti accad. Lincei* 29, ii, 385-8(1920); *Science Abstracts* 24A, 442.—The app. adopted in these expts. is similar to that used by Franck and Hertz, and is briefly described; the expts. are, however, considered as of a preliminary nature and should be carried out under better conditions. Certain modifications are suggested.

H. G.

Resonance and ionization voltage of mercury. E. EINSPORN. *Z. Physik* 5, 208-19(1921).—E. dets. the acceleration voltages corresponding to inelastic impacts of electrons with Hg mols. These impacts occur at 4.9 v. ($\lambda = 2537 \text{ \AA}$) and at all combinations of 4.9 and 6.7 ($\lambda = 1849 \text{ \AA}$) v., but not at 6.7 v. alone. The ionization voltage is carefully detd., the resonance voltages being used as reference points, and a value of $10.38 \pm .05$ v. being obtained.

F. C. HOYT

Emissivity of iron and copper. K. LUBOWSKY. *Elektrotechn. Z.* 42, 79-81(1921); *Science Abstracts* 24A, 279-80.—The emissivity of both bright and blackened Fe and Cu was detd. Curves are given showing the effect of convection currents obtained from a flat plate of the material, first perpendicular to, and second in the direction of the air stream. Expressed in watts per sq. cm. per 1° of temp. excess, the emissivity varies from 0.75×10^{-3} to 1.5×10^{-3} under the various conditions. W. E. RUDER

Molecular motion and the laws of thermal radiation. LÉON BRILLOUIN. *J. phys. radium* 2, 142-55(1921).—A mathematical analysis in detail is given of the Brownian movement of a particle in an empty chamber which is filled with isothermal radiation. Three cases are considered where the radiation is totally absorbed, partially absorbed, or reflected. In order to avoid all difficulties and render the argument completely general, the particles are considered to be sufficiently large to possess the classical optical properties. Fluctuations of absorption or emission have been evaluated by the thermodynamic method. In all the cases studied, the calcn. leads to a demonstration of the Wien displacement law. From the general argument used it is impossible to derive any definite formula for the black body law, and although certain authors deduce a black body formula from analogous arguments, it is because their calsns. of fluctuations implicitly permit a particular hypothesis. Evaluating fluctuations by single interferences leads to Rayleigh's law, while using quanta or the laws of emission from an atom of the Bohr type leads to Planck's formula. B.'s very general argument only supposes that the elementary laws of emission and absorption support, in general, the black body distribution law and, at the same time, the fluctuations which ought to correspond to it statistically. It was found necessary to use the hypothesis that the radiation is direct, and in the case of a reflecting sphere to suppose the independence of fluctuations in the different parts of one wave plane. As already pointed out by Einstein, these same difficulties exist in all the general reasoning on this subject. E. N. B.

Magnetic electron. ARTHUR H. COMPTON. Washington Univ., St. Louis. *J.*

Frank. Inst. 192, 145-55(1921); cf. *C. A.* 15, 1248.—The following conclusions are reached: "In the first place, the Richardson-Barnett effect shows that magnetism is due chiefly to the circulation of negative electricity whose ratio of charge to mass is not greatly different from that of the electron. In the second place, expts. on the diffraction of the X-rays by magnetic crystals indicate that the elementary magnet is not any group of atoms, such as the chem. mol., nor even the atom itself; but lead rather to the view that it is the electron rotating about its own axis which is responsible for the ferromagnetism. And finally, positive evidence in favor of the hypothesis of some form of magnetic electron is supplied by a consideration of the curvature of the tracks of β -rays through air. The electron itself, spinning like a tiny gyroscope, is probably the ultimate magnetic particle." JOSEPH S. HEPBURN

Influence of a magnetic field on the dissociation of excited molecules. J. FRANCK AND W. GROTRIAN. *Z. Physik* 6, 35-9(1921).—Mols. are able to receive from light absorption or electron impact more energy than is required for thermal dissociation. This energy goes into changes of electron orbits preparatory to light emission. This is the case in Hg and I vapors at low pressure. At higher pressures when the mol. suffers more collision after excitation and before emission it is more readily dissociated. Other disturbances may have the same effect. Thus a magnetic field greatly reduces the fluorescence of *I vapor*. F. and G. show that a magnetic field will cause dissociation of the metastable Hg, formed by excitation of Hg vapor with 2536 Å. radiation. F. C. HOYT

Contact electricity in high vacuum. ALFRED COHN AND ALBERT LOTZ. *Z. Physik* 5, 242-63(1921).—In the highest vacuum obtainable by modern methods a production of charge still takes place on the contact of 2 dielectrics. The sign of the charge is always such that the substance with higher dielec. const. is +. Metals and amalgams, contrary to results of others, show with respect to glass a charge which is always reproducible. The sign is dependent on the electrochem. properties of the metal. F. C. HOYT

Relation between photoelectric effect and contact potential. P. PRINGSHEIM. *Ber. physik. Ges.* 21, 606-14(1919); *Science Abstracts* 24A, 448.—Observations relating to Einstein's " $h\nu$ " equation and Millikan's exptl. results. H. G.

The nature of X-rays. PAUL ERCULISSE. *J. pharm. Belg.* 3, 469-71, 485-8, 521-3, 541-3, 557-8(1921).—A lecture. A. G. DUMEZ

Hardness and potential in the Coolidge-tube. HERMANN BEHNKEN. *Z. tech. Physik* 2, 153-160(1921).—A technical discussion. HARRY CLARK

The röntgenograms obtained by means of mica-piles composed by crossed lamellas. F. M. JAEGER. *Proc. Acad. Sci. Amsterdam* 23, 676-8(1921); *Verslag. Akad. Wetenschappen Amsterdam* 29, 559-82(1921).—On the basis of further expts. (*C. A.* 14, 3584) it is now concluded that the diffraction effects obtained from crossed lamellas of mica can be considered as the superposition of the effects from the individual plates. Slight differences that are observed are to be attributed to absorption of X-rays by the mica and to a general fog. RALPH W. G. WYCKOFF

The fine structure of X-ray series. D. COSTER. *Compt. rend.* 173, 77-9(1921).—Results are given of precise measurements of L series lines of the elements from Ta to U. A new line, γ_6 of L_2 , is found in some of these elements and a discussion of Moseley diagrams shows that it exists probably in all. The principle of combinations is discussed and a system of 19 energy levels (critical absorption frequencies) is proposed. It is noted that only rarely is a line found, the frequency of which is equal to the sum of the frequencies of two other lines; C. suggests that the energy levels of an atom are divided into 2 groups and that lines usually represent a passage from one group to the other, and only rarely a passage between 2 levels of the same group. H. C.

Absorption of X-rays in crystals. T. E. AURÉN. *Medd. Vetenskapsakad. Nobel-*

inst. 4, No. 10, 1-6.—The at. absorption coeffs. relative to water previously detd. (*C. A.* 15, 1855) are used in calcg. the mol. absorption of the cryst. compds. KCl, NaCl, CaCO₃, CaSO₄·2H₂O and alum. The calcd. values agree closely with the observed results except when the incident rays are nearly parallel with the at. planes in cubical crystals.

F. O. A.

The X-ray absorption spectra of chlorine. AXEL-E. LINDH. *Compt. rend.* 172, 1175-6 (1921).—A vacuum spectrometer with gypsum crystal was used to study the absorption of X-rays by Cl in the form of gas and also in compds., a list of which is given. The wave-length of the K discontinuity is 4.384 Å. U. for the gaseous Cl and for the Cl in all the compds. where the valency is 1; it is about 0.006 Å. U. shorter for the Cl having valence 5 in KClO₃, and about 0.012 Å. U. shorter for valence 7 in KClO₄.

HARRY CLARK

The law of photographic blackening by X-rays. R. GLOCKER AND W. TRAUB. *Phys. Inst., Stuttgart. Physik. Z.* 22, 345-52 (1921).—Hauff-Röntgen plates were exposed to secondary radiation from Se, Sr, Mo, Ag, Sb, and Ba, excited by the rays from a Coolidge tube. Ionization measurements were made on these secondary radiations while the plates were being exposed in order to take account of changes of intensity. The plates were carefully protected from extraneous radiation and from the effects of scattering. They were developed with adurol developer at 18°. It was found that there is no "threshold" value of exposure for X-rays. "Blackening" (*S*) is defined by $S = \log_i J_0/I$ where *J*₀ and *I* are the intensities of incident and emergent beams of white light, resp. The curve of blackening as a function of the time of exposure to rays of const. intensity runs as follows—up to *S*=0.6, *S* is directly proportional to *t*; as *t* increases further, *S* increases more slowly so that beyond the value of *t* corresponding to *S*=1.3, *S* is directly proportional to $\log t$. The actual values of *S* as taken from the plates is corrected for fog by subtracting 0.2. Similar curves were obtained for all wave-lengths between 0.4 and 1.1 Å. The Bunsen equation (equal values of *I* × *t* give equal degrees of blackening) was found to be approx. true. HARRY CLARK

An apparatus for measuring ionization in radiology. SOLOMON. *Compt. rend.* 173, 34-5 (1921).—For an app. measuring ionization to be useful in medical radiology it must satisfy the following conditions: (1) very great simplicity of manipulation; (2) easy method of measuring the energy at the surface and in the interior of the body; (3) a proof of a parallelism between the absorption by the tissues and the air of the ionization chamber. An app. is described which seems to meet these conditions. It consists of a gold-leaf electroscope of variable capacity. By means of a commutator an auxilliary capacity can be added and the capacity of the instrument quadrupled, thus increasing the time over which observations may be extended. The deflections of the gold leaves are read on a divided scale. The gold leaves are charged by means of a small frictional elec. machine. By allowing a slow discharge of the needle through a small cylinder of ebonite the reading of the gold leaves may always be made to begin at the same division of the scale. The electroscope is mounted inside a block of lead which is connected to the earth, thus providing protection against electrostatic effects and against penetrating radiations such as X-rays. The ionization chamber is of graphite in the form of a small cylinder 15 mm. in diam. and 30 mm. long. It can thus be introduced in the natural cavities of the body. The calibration of the instrument can be made with a known quantity of Ra and the relation between the subdivisions of the scale and the usual units established. A. W. SMITH

Cohesion forces in the diamond. A. LANDÉ. *Z. Physik* 6, 10-11 (1921).—Adams' (*C. A.* 15, 1237) value for the compressibility of diamond is in better agreement than previous values with L.'s theory of the structure of the space lattice. Cf. *C. A.* 15, 2384. F. C. HOYT

Investigation by means of X-rays of the crystal structure of sodium chlorate and sodium bromate. N. H. KOLKMEIJER, J. M. BIJVOET AND A. KARSEN. *Proc. Acad. Sci. Amsterdam* 23, 644-53 (1921).—The units of structure deduced for these salts from a study of their powder reflections contains in both cases 4 chem. mols. The length of the side for the chlorate is found to be 6.55×10^{-3} cm., for the bromate 6.74×10^{-3} cm. The Na and halogen atoms are said to be displaced by small amounts from the positions occupied by corresponding atoms in NaCl along alternate diagonals of the 8 small cubes of which the unit is composed. If a is one of the 3 equal coördinate values of a Na atom $\frac{1}{2}$ — b a similar value for a halogen atom and p , q , r the coördinates for an O atom, the calcs. of intensity are said to be in accord for both salts with $a = \frac{1}{12}$, $b = \frac{1}{12}$, $p = \frac{1}{4}$, $q = \frac{5}{12}$, $r = \frac{11}{12}$.

RALPH W. G. WYCKOFF

Magnetic rotatory dispersion in transparent liquids. R. A. CASTLEMAN, JR., AND E. O. HULBURT. *Astrophys. J.* 54, 45-64 (1921).—The electron theory of H. A. Lorentz is modified to suit the rotation in a range of spectrum for which electrons of only one type need be considered. The rotation for any wave length is given by a formula involving the refractive index, field strength, and length of path together with the crit. frequency, number per unit vol. charge and mass of the electrons. The formula was applied to data obtained for this purpose by observing magnetic rotations at six wave lengths from $\lambda 4360$ to $\lambda 6200$ Å, in substances which conform to the dispersion theory of Lorentz. The field strength used was 6480 gauss; the length of path was 2 cm. Data were obtained for CS₂, α -monobromonaphthalene, benzene, nitrobenzene, and EtI. The observations are well represented by the formula in the region to the red of $\lambda 5900$ Å, but for shorter waves the theory gives values somewhat greater than those observed. This discrepancy increases with decreasing wave length, indicating that it is due to the violet absorption neglected in the theory. The value of e/m for the active electrons was found to depend on the liquid and varied from 0.5 to 1.78 e. m. u.

K. BURNS

The anomalous Zeeman effect. I. A. LANDÉ. *Z. Physik* 5, 231-41 (1921).—For single lines the Sommerfeld and Debye quantum theory explanation gives a normal triplet in a magnetic field. This is because the equatorial momentum is related to the magnetic energy by a single const. factor. From the observed nature of the effect for doublets and triplets this factor must here have different values for the different terms. A change in the momentum gives then a series of energy changes that lead to the complex structure in a magnetic field. The problem is thus reduced to explaining the nature of this variable factor. It can be attributed to an anomalous value of e/m .

F. C. HOYT

Quantitative spectroscopy of silicon in fused salts and in steel. A. DE GRAMONT. *Compt. rend.* 173, 13-7 (1921).—A method previously used for the quant. spectroscopy of Ti (cf. *C. A.* 12, 1358) has been employed for the study of Si spectra. Ordinary com. photographic plates were employed and measurements restricted to the range $\lambda 4800$ - $\lambda 2200$ Å. U. Tables showing the extinguishing of the characteristic lines with reduction of the Si content are given. Thus for Si in an alk. flux a content of 0.35% Si gives 23 distinct lines within this range, while at 0.005% Si but 3 lines remain (2881.6, 2524.1, 2516.1). At greater dilns. the alkali employed contains sufficient Si to cause persistence of these lines. For steels, a content of 14% Si gives 18 distinct lines, which are reduced to a single line (2516.1) at 0.05% Si.

S. L. CHISHOLM

A study of arc-cathode spectra. ARTHUR S. C. DUNSTAN AND BENJAMIN A. WOOTEN. *Astrophys. J.* 54, 65-75 (1921).—A direct current arc was inclosed in a furnace and the vapors of various metals were introduced into this arc by means of an a. c. arc 5 cm. below it within the same inclosure. The spectra observed included those of Sr, Ba, Li, Cu, and Pb, thus covering a large range of at. wt. The expts. amply verified

the fact that the intensity of metallic lines is always greater at the cathode than at the anode, when the metal is introduced into the arc symmetrically. The observations were planned so as to test various theories that have attempted the explanation of this phenomenon. The electrodes were alternately water-cooled and the arc in the neighborhood of the cooled electrode was shown to be at a lower temp. than elsewhere. The cooling did not affect the phenomenon. It was shown that the effect is not due to electrolytic nor electrostatic sepns. The spectrum of a 60-cycle a. c. arc, taken by means of a rotating sector synchronized to transmit light during only half of each cycle, is the same as the spectrum of a d. c. arc, showing that the phenomenon is fully developed in 1/120 sec. The transference of vapor from one electrode to the other must therefore be of little importance. When pellets of metallic salt were dropped rapidly through the arc, the spectrum lines were stronger on the end toward the cathode. The evidence as a whole indicates that the light is due chiefly to bombardment of the metallic vapor by electrons from the cathode. While the lines of all metals are stronger at the cathode, the difference decreases with increasing at. wt. K. BURNS

The electric furnace spectrum of scandium. ARTHUR S. KING. *Astrophys. J.* 54, 28-44(1921).—The spectrum of a pure sample of scandia was observed in the carbon arc and in the elec. furnace through the range λ 3015-6559 \AA . The furnace was operated at the usual low gas pressure, and temps. of 2200°, 2250°, and 2600° were used. A table gives the classification of 257 lines with respect to their behavior in the arc and at various furnace temps. Some 25 lines are indicated as being enhanced in the arc; 150 are enhanced in the furnace. The 29 arc-flame lines belong to the latter class, some of them showing moderate strength at all temps., while others increase in intensity more or less rapidly with increasing temp. These lines are not due to oxidation, but the bands on the other hand are quite probably due to the oxide. Lines which appear at low temp. and those enhanced in the furnace arc weak or lacking in the general solar spectrum but prominent in that of sun-spots. Therefore, this investigation will be of great assistance in the interpretation of solar phenomena. The Zeeman effect for Sc lines is large and apparently uniform in sunspot spectra. Lab. observations have not as yet been made. Chem. properties: Scandia fused in the furnace seemed to form a carbide with the graphite of the boat. The glossy black residue became a gray-brown powder on exposure to the air, presumably reabsorbing O. K. BURNS

Liquid crystals. V. Photographic absorption and extinction measurements. RASSA RIWLIN. *Proc. Acad. Sci. Amsterdam* 23, 807-16(1921); *Verslag. Akad. Wetenschappen Amsterdam* 29, 127-36(1921).—A method for the photographic detn. of absorption spectra is given, and applied to the study of the various forms of *p*-azoxyanisole. Distinct differences are found in the spectra of the forms isotropic liquid, "ex-solid" (obtained by melting the solid) and "ex-liquid" (obtained by cooling the liquid). GEORGE W. MORRY

The so-called cyanogen bands. G. HOLST AND E. OOSTERHUIS. *Proc. Acad. Sci. Amsterdam* 23, 727-8(1921); *Verslag. Akad. Wetenschappen Amsterdam* 29, 47-8 (1921).—The bands between 3855 and 3883, and 4158-4214 \AA , which were formerly ascribed to CN, but which Grotian and Runge (*C. A.* 8, 2840) concluded belong to N₂, are probably CN bands, as they disappear when the lower half of the discharge tube is immersed in liquid O. GEORGE W. MORRY

Investigations in the second positive group of the band-spectrum of nitrogen. PAUL ZETT. *Z. wiss. Phot.* 21, 1-27(1921).—In order to get the widest possible dispersion for the sepns. of the bands into their constituent lines, 2 Rowland concave gratings were used of 6.3 m. and 6.6 m. radius of curvature and having about 8000 lines to the cm. Under changes in pressure from 1 to 18 mm. no variations in relative intensity of the lines in a series could be noted. The bands measured lay from about 3500 \AA . U

to 3309 Å. U., and their lines were classified into series which, in general, followed the first law of Deslandres. In one band, at 3480-3871 Å. U., a series of lines was found whose differences showed a max., in agreement with Thiele's law. Several series were noted, among which there were missing or weakened lines, and one abnormal triplet sequence was found at 3323-3287 Å. U., the differences between whose lines decreased toward the violet.

G. R. FONDA

Absorption measurements. I. Absorption coefficient of iodine solution in the visible spectrum. L. S. ORNSTEIN AND H. C. BURGER. *Verslag. Akad. Wetenschappen Amsterdam* 29, 573-6(1921).—Light from a monochromator passed through the soln., and was brought to a focus on a thermocouple, whose deflections were registered photographically. Details are not given, but it is stated that in all cases the absorption followed Beer's law. The results for I dissolved in benzene, toluene, xylene, EtOH, CHCl_3 and CS_2 are given in curves.

GEORGE W. MOREY

Polarization of the radiation in the quantum theory. N. BOHR. *Z. Physik* 6, 1-9(1921).—Rubinowicz (*C. A.* 15, 2238) has attempted to det. the type of polarization to be expected in the radiation from any atomic system. The principle made use of is the analogy between a stationary field of radiation in equil. with an oscillator to a mechanical system, which leads to a conservation of angular momentum between the two. B. shows that the results are essentially the same as result from his "correspondence" principle and will give the polarization of the radiation only in the case of a single electron and nucleus.

F. C. HOYT

Dispersion of the optical symmetry axes of gypsum, augite and adularia in the short wave length infra-red. ERICH GOENS. *Z. Physik* 6, 12-28(1921).—G. dets. the position of the optic axes from the dependence of the transparency and reflective power for perpendicularly incident, monochromatic and linearly polarized light on the orientation of the plane of vibration of the elec. vector with respect to the crystal. The directions of max. and minimum transparency and reflective power indicate the positions of the optic axes.

F. C. HOYT

Theory of molecular refractions. GERVAIS LE BAS. *Chem. News* 122, 194-6(1921); cf. *C. A.* 12, 1776.—The magnitude of the ordinates, when the mol. dispersions of different spectral lines relative to a single line are plotted against the wave lengths, gives a measure of the degree of unsat. of the compd. Traube had shown the existence of a simple relation between valence and at. refractivity; $C = 4 \times 0.78$, $N = 3 \times 0.78$ and $O = 2 \times 0.78$. In oxonium compds. the dispersion indicates a valence of 4 for O. There is some evidence of negative unsat. in some compds. When a methyl group is substituted for H in a paraffin or cyclo-paraffin there is an excess dispersion equal to 0.14 while similar substitution in the benzene series brings about a similar excess of 0.28. In N compds. the excess for each valence bond is 0.14. The adding of the halogens to unsatd. C results in an augmented mol. refractivity of 0.17 for F up to 0.25 for I. Much more exptl. work is needed before generalizations may be drawn as to the effect of other substitutions and as to the complications due to the presence of various more or less satd. groups.

F. O. A.

New applications of Einstein's photochemical equivalence law. WALTER NODDACK. Univ. Berlin. *Z. Elektrochem.* 27, 359-64(1921); cf. Nernst, *C. A.* 15, 1103.—It is shown that the system Br vapor-hexahydrobenzene follows Einstein's photochem. equivalence law, deviations being attributed to exptl. error and to complicated dark reactions. The liquid system $\text{Cl}_2 \mid \text{CCl}_4\text{Br}$ also obeys this law. On dilg. the mixt. with CCl_4 , the photochem. effect decreases as the diln. increases. This is attributed to a loss of energy by the active mols. through collisions with the CCl_4 mols. Radiation of the mixt. $\text{Cl}_2 \mid + \mid \text{CCl}_4\text{Br} \mid + \mid \text{CCl}_4$ represents a limiting case of pure photochemistry; the radiant energy is partially transformed into chem. energy and partially into heat.

From the decrease in the photochem. effect the life of a Bohr state (*Bohrschen Zustand*) is calcd. to be 10^{-9} sec.

H. JERMAIN CREIGHTON

Investigation of the principle of photochemistry. P. LASAREV. Moscow. *Z. physik. Chem.* 98, 94-7 (1921).—The influence of O on the velocity of the photochem. process in dyestuffs has been studied at a pressure of 150 atms. It has been found that the velocity of bleaching, V , is given by the equation $V = \beta(1 - e^{-KC_1})$, where β and K_1 are consts. and C_1 is the concn. of the O. From the data obtained, it is shown that the fundamental law of the bleaching of dyes must have the form $-dc/dt = \alpha_0(1 - e^{-KC}) - (1 - e^{-KC_1})$, where C is the concn. of the dye, and α_0 , K and K_1 are consts. The mechanism of photochem. reactions in dyes, which is represented by this equation, is discussed in the light of the modern theory of the structure of the atom.

H. JERMAIN CREIGHTON

Electronic theory of conductivity of metals in a magnetic field (CORBINO) 2. Thermal analogy of the Oersted-Ampère effect and the electronic theory of metals (CORBINO) 2. X-ray analysis of adularia and moonstone, and the influence of temperature on the atomic arrangement of these minerals (KOZU, ENDŌ) 8. The catalytic oxidation of some alcohols under the influence of photoactive ketones (BÖGESEN) 10.

4—ELECTROCHEMISTRY

COLIN G. FINK

Lloyd W. Chapman. ANON. *J. Elec. Western Ind.* 47, 247 (1921); 1 illus.—An obituary.

C. G. F.

Electric furnaces for making steel. III. Héroult furnace. ALFRED STANSFIELD. *Blast Furnace Steel Plant* 9, 324-7 (1921); cf. *C. A.* 15, 1482 and 2794.—The outstanding example of the direct heating series-arc furnaces is the Héroult. The 3-phase Ludlum and the 2-phase Vom Baur furnaces fall under the same classification. The characteristics and details of construction of the Héroult furnace are given. Data are tabulated for different sizes of furnaces (1- to 25-ton) for power consumption per ton, transformer capacity, sizes of electrodes (both carbon and graphite), and sizes of Cu conductors. A summarized list (sizes, number, and products) of the Héroult furnaces building and operating in the U. S. on Sept. 1, 1919 is given and a list of references to literature on Héroult furnaces. **IV. Ludlum and Vom Baur furnaces.** *Ibid* 381-5.—The Ludlum furnace in general resembles the Héroult but differs from it in being oval instead of circular in plan and in having its 3 electrodes arranged in a straight line. The spout is at one end of the furnace instead of at the side and thus permits tilting through a smaller angle when pouring. The oval furnace ensures more even heating of the walls from the 3 arcs than does the circular furnace. There are 20 Ludlum furnaces in operation ranging from 2 tons to 10 tons in capacity. They are used both for steel melting and for duplexing grey Fe. The Vom Baur furnace closely resembles the Ludlum in its construction. It operates on 2-phase supply. **V. Keller and Stobie furnaces.** *Ibid* 424-5.—The Keller furnace is of the series-arc type. It resembles the Héroult furnace except that the electrode supports are sep. from the furnace shell. Hence the electrodes must be lifted out of the furnace before pouring. While such an arrangement is of value when it is necessary to change an electrode as soon as it becomes short it is of less advantage with the present practice of using threaded electrodes. The Stobie furnace is a recent form of series-arc furnace. Its design has varied but the newer furnaces are octagonal in plan, have 4 electrodes, and use 2-phase current. They have been built in sizes up to 15 tons. A 15-ton furnace has turned out Ni-Cr steel in 6-hr. heats, 24 heats per week, with a power consumption of 600-25 kw. hrs. per ton

of salable ingots. **VI. Direct-heating electrode-hearth arc furnaces.** *Ibid* 488-9.—An electrode-hearth arc furnace in its simplest form has one arc and one electrode, the furnace itself being conducting and serving as the other electrode. Such a furnace is easier to operate than a series-arc furnace as there is only 1 arc in each elec. circuit. The conducting hearth is, however, a source of some difficulty both in construction and maintenance. There are 2 types of electrode-hearth furnaces. First, those in which absolute elec. contact is necessary between the charge and the metallic conductors in the hearth before the furnace can be started (e.g., the Girod, Keller, Snyder, and Chaplet furnaces). In the second type such contact is not essential to starting the furnace, but the hearth is so constructed that it becomes conducting when hot and then serves as an electrode. The Electro-metals, Greaves-Etchells, Nathusius, and Pittsburgh furnaces are of this type. Diagrams showing the typical electrode arrangements and the elec. connections for the above electrode-hearth furnaces are given. **VII. Girod furnace.** *Ibid* 550-2.—The Girod furnace was the earliest example of the electrode-hearth arc furnaces used commercially in steel making. The typical Girod furnace is a tilting furnace, either circular or square in plan, with one electrode entering through the roof and 6 water-cooled steel contacts passing through the hearth. During operation, the upper parts of these steel rods become melted but they are renewed again from the steel of the bath at the end of a heat. The Girod furnace is considered to have an advantage over the series-arc furnaces in melting down cold scrap because a current will flow evenly through the scrap, heating it by its own resistance as well as by the heat of the arc. The furnace operates at a low voltage from the fact that there is but one arc in the circuit. While low voltage supply tends to greater steadiness in melting cold scrap, it increases the cost of elec. power due to increased losses in conductors on account of the larger currents, and to losses in the electrodes. Girod furnaces originally used only single-phase current. The larger sizes are now constructed for 3-phase. The method of connecting to 3-phase supply is described. Details of the operation of a 12-ton European installation and of a 10-ton American installation are given. L. J.

Making a 5% nickel-cast-iron alloy in an electric furnace. D. N. WITMAN. *Trans. Am. Inst. Mining Met. Eng.* 1921, No. 1087-S, 4 pp.—The metal sections of these elec. resistance grids are quite uniform for each pattern, but the pattern sections vary from $\frac{1}{2} \times \frac{1}{2}''$ to $\frac{1}{8} \times \frac{1}{8}''$. The elec. resistance of a perfect casting lies within 10% of the fixed resistance for each pattern, so good molding is essential. With absolutely correct metal a variation of 0.01" in width and thickness may mean 12-14% variation in resistance. The metal, even in the smallest castings, must be very soft, showing an open, grey, highly graphitic structure, in order to stand shock and rough usage. It is a grey iron alloyed with 4-5% Ni, which element imparts toughness and pliability, and helps to overcome the tendency of metal to run white, owing to rapid cooling in the mold. These castings can be twisted, cold, into various shapes, taking a permanent set without breaking. Their elec. resistance is almost twice that of ordinary cast Fe. The Ni content makes it necessary to cast at a much higher temp. (1500-1600°) than that required for cast Fe. The required aunts. of pig, scrap, and Ni, with some retort carbon, are charged, and the melting down is carried on with 110 v. and 0-3000 amps., requiring in all about 1 hr. No time for chem. tests is allowed, but adjustments are made on the basis of cast test specimens. The Ni causes the rejection of graphite by the alloy when it is just melted; but when the metal is superheated it again takes up the C previously thrown out. The av. power consumption was 1100 kw. hr. per ton, and the electrode consumption was 28 lbs. per ton. The advantages of the elec. furnace for this material lie in the control of compn. while the metal is in the furnace, the attainment of a higher casting temp., and the absence of contamination by S. W. E. R.

The Tungar rectifier in electroplating. ANON. *Brass World* 17, 222(1921).—This

type of rectifier is now available for jewelers in operating electroplating vats. A 2-amp. Tungar of half wave-length is sufficient for a tank up to 6 gal. (22.7 l.) capacity. Owing to the pulsating character of the current, the surface of the finished article is much more shiny than that plated by steady current from a battery. The deposit is more closely grained.

W. H. BOYNTON

The electrolytic reproduction of engraved printing plates. W. BLUM AND T. F. SLATTERY. *Chem. Met. Eng.* 25, 320-1 (1921).—Deposition of alternate layers of Ni and Cu on engraved printing plates gives them the necessary strength to avoid curving in use. The plate must be very resistant to abrasion. The best procedure is to prep. by electrodeposition a metal mold or negative of the original plate, known as the "alto" plate. Ni is electrodeposited on steel plate brushed with graphite. Cu and Ni are then alternately deposited until the desired thickness is obtained. The actual printing plate, or "basso" which is an exact duplicate of the original is deposited upon the alto plate. Higher c. ds. and deposits of greater tensile strength are possible in the presence of fluorides. Ni prevents further growth of Cu crystals, reduces the tendency to form trees and allows greater c. ds. for the deposition of Cu. Numerous details are still to be worked out.

W. H. BOYNTON

Survey of nickel solutions (I). JOSEPH HAAS, JR. *Metal Ind.* 19, 384-6 (1921).—A series of tests was made of the effect of adding various salts and acids to a bath contg. 12 gal. of NiSO_4 per gal. The single salt alone yielded no Ni deposit, but gave only a scum of Ni(OH)_2 . The addition of NH_4Cl and Na citrate gave good deposits while NaCl and MgSO_4 gave no deposit. The inorg. acids HNO_3 , HCl , and H_2SO_4 gave excessive gassing, causing brittle deposits. H_3PO_4 gave a ppt. of $\text{Ni}_3(\text{PO}_4)_2$, while boric acid gave good results, both in color and character of deposit. This latter bath contained 12 oz. NiSO_4 and 2 oz. H_3BO_3 per gal., and a c.d. of 6-12 amp. per sq. ft. at 1.5-3.0 v. was used. Citric acid gave a good deposit, but the acids benzoic, tارتaric and acetic gave large polarization values. H. points out that citric acid and Na citrate act to prevent the pptn. of Ni(OH)_2 . H_3BO_3 also acts to prevent the formation of Ni(OH)_2 owing to hydrolysis.

C. H. ELDREDGE

A really new and perfect tank filter for plating solutions. ANON. *Brass World* 17, 235 (1921).—The outfit consists of suction piping, a reservoir and pump, and a filter. The reservoir 20" high and 3" in diam. is sealed at the top and in it a pressure head of liquid is built up. The liquid is thus forced down through a filter bag. This bag consists of heavy wool cloth bound with wool yarn and the bag is clamped in a ring. Air at 2 lbs. pressure takes the liquid continuously from the bottom of the tank and pumps it through a fine-meshed filter, cleansing it of all large foreign substances. The continuous cleaning of electrolyte insures a clean smooth deposit, eliminates blemishes, discoloration and pinholes, and the air agitation allows the use of high voltage.

W. H. B.

A low voltage, self-starting, neon-tungsten arc-incipandescent lamp. D. McFARLAN MOORE. *Trans. Illum. Eng. Soc.* 1921, preprint.—At the present time all theory seems to indicate that to increase materially the luminous efficiency of light sources in general, one must resort to gaseous radiation by means of which it may be possible to reduce to about $1/10$ the energy now required. The new lamp (type 1) even though it is a gaseous conduction lamp, operates on 110-volt circuits and has a power consumption as low as 0.25 watt from the supply system. A series resistance of several hundred ohms is placed in the base. The light consists of a velvety pinkish glow or corona enveloping the parallel wire helices. These helices are 0.75 in. in diam. and 1 in. long and are made of Al or Fe. The bulb contains Ne gas at 30 mm. pressure. The sp. energy consumption is 15 watts per spherical c. p. The lamps operate on either a. c. or d. c. If in place of the large Al helices small W helices are substituted (type 2)

and these kept at incandescence the power consumption is 3 watts per spherical c. p. This W-Ne type has a series resistance of 624 ohms in the base. Upon starting the lamp there first appears surrounding the W electrodes (see fig.) a close fitting elec. glow or corona discharge having the characteristic reddish color of Ne; the current flowing is about 0.02 amp. with a power consumption of 5.5 watts; but the current steadily increases, so that in a few seconds it reaches stability at 0.125 amp. (26.2 watts) and the dim reddish corona evolves into a horizontal cylinder of intense white light of about 7.1 spherical candles. In the fig. shown the electrodes e and e' consist of 20 turns of 0.0025 W wire wound on a mandrel of 0.05 in. diam. The gap between the electrodes is $\frac{1}{16}$ in. The helix form lends itself particularly well for using all the energy of the corona glow. If the series resistance is reduced and the current allowed to rise, the discharge develops into an arc (type 3—shown in the original) and at the same time the voltage drops to less than half. The c. p. increases rapidly and the power consumption drops to 1.08 w. p. c. (spherical). This Ne-W arc lamp is particularly well suited for projection purposes.

C. G. F.

Thermionic tube—a return to simplicity. L. C. POCOCK. *Electrician* 87, 232-4 (1921).—For the benefit of engineers and others who did not study the early development of the thermionic tube, P. outlines the elementary theory of its behavior. Making the usual simplifying assumptions and avoiding the use of differential equations, the practical formulas are derived.

D. MACRAE

Transformer oil sludge. C. J. RODMAN. *Trans. Am. Electrochem. Soc.* 40, preprint (1921).—Three types of transformer oil sludge, the asphaltic, the soap and the carbon, are described. The asphaltic and soap sludges are produced most readily by poor oil, contg. unsaturates, water, small resinous bodies and certain accelerators. The asphaltic is an oxidation and polymerized product of attackable oil, and is the most general form of sludge. It collects upon the active parts of the transformer, thus preventing the dissipation of heat. If free from moisture, its elec. properties are fairly good. The soap sludge is a good moisture and O carrier. It forms slowly and is difficult to remove entirely by filtration. The carbon type is produced during elec. breakdown. Highly refined oil of the satd. paraffin series, which is carefully filtered when the dielec. strength begins to lower during operation, can be successfully used for many years.

C. C. VAN VOORHIS

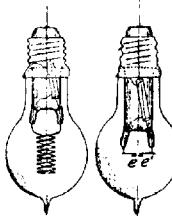
Lacquer finishes on chandeliers (SCOTT) 26. Electrical resistance materials (KENNEDY) 13. Fusible metal for electrical purposes (JAP. pat. 36,896) 9.

Storage battery. J. M. AHLGREN. U. S. 1,384,816, July 19. Structural features.

Apparatus for preventing rusting of storage battery pole. GAI KAWAMURA. Japan 36,880, July 31, 1920. Electrolyte in a storage battery creeps on to the pole, produces a local current in the pole, and thus causes elec. corrosion. To prevent this, a cup-shaped vessel contg. a semi-liquid fat is fixed to the foot of the pole.

Electrolyte for storage batteries. F. D. CHENEY. U. S. 1,385,305, July 19. An electrolyte for storage batteries is formed of Na phosphate 4 oz., H_2SO_4 1 qt. and H_2O 1 qt. The phosphate serves to facilitate rapid charging of the battery without injury.

Manganese material for electric batteries. O. E. RUHOFF. U. S. 1,385,151, July 19. A material suitable for use as a depolarizing agent in elec. batteries is prep'd. by roasting MnO_2 ore at a temp. above redness and then, after cooling, treating the



roasted material with dil. HCl or H₂SO₄, filtering off the soln. and washing the residue. Cf. *C. A.* 14, 2300.

Electrolytic production of aluminium compounds. M. O. SEM. U. S. 1,382,808, June 28. A soln. containing Al₂(SO₄)₃ equiv. to 70 g. Al₂O₃ and Na₂SO₄ equiv. to 10 g. Na₂O is electrolyzed at 60-80° in a diaphragm cell. Fe which is present in the soln. is deposited at the cathode and Al(OH)₃ is formed as a ppt. containing some SO₄ in the form of adsorbed acid or basic sulfate. When this product is calcined, it contains less than 0.1% of Fe and is well adapted for the production of Al. Free H₂SO₄ obtained in the anode compartment may be used to dissolve raw material such as labradorite for the continuation of the process. Undissolved residue accumulates in the anode compartment and is sepd. from time to time by filtration. The catholyte is in part removed from the cell at intervals and salts which it carries in soln. are permitted to crystallize. HNO₃ may be used in a similar process instead of H₂SO₄, with production of NH₄NO₃.

Apparatus for refining aluminium or other metals. S. A. TUCKER. U. S. 1,384,499, July 12. An electrolytic cell for refining Al, Mg, Ca, Na or other metals is formed with a container for the unrefined metal and another container for the refined metal communicating with each other only through an electrolyte, such as fluorides of Al and Na and Al₂O₃ in Al refining.

Apparatus for electric separation of suspended particles from gases. E. R. WOL-CORR. U. S. 1,383,586, July 5.

Zinc metallurgy in the electric furnace. HARUO TSUBOI. Japan 37,039, Sept. 4, 1920. A mixt. of powdered ZnO ore, coke, 10% powdered lime and 10% powdered spongy iron is heated in an elec. furnace. The Zn vapor is filtered through a red-hot coke layer and passed to a condensing chamber. Details of the furnace are given.

Lead plating. ZENJI SUGAWARA. Japan 37,221, Oct. 6, 1920. PbO, 100 g., is dissolved in concd. NaOH and 30 g. Al(OH)₃ + 30 g. Na borate are added. The whole is made to 1 l., mixed with 5 g. glycerol and allowed to settle. Lead is deposited from the clear soln. with an e. m. f. of 5 v.

6—INORGANIC CHEMISTRY

H. I. SCHLESINGER

Molybdo-malates of ammonium and sodium. E. DARMOIS. *Compt. rend.* 172, 1486-7(1921); cf. *C. A.* 15, 2831.—The very active cryst. compd. previously described can be obtained (1) by action of NH₄ molybdate on acid NH₄ malate; (2) action of MoO₃ on neutral NH₄ malate. In the latter case the MoO₃ may be indifferently the yellow, sol. form, the white, insol. form, or the very sol. form obtained from Ba molybdate and H₂SO₄. The rotations of a series of mixts. (MoO₃)_nC₄H₄O₆, where *n* had the values 1, 1.5, 2, 2.5, 3, 4, 5, indicated consistently the ratio MoO₃:C₄H₄O₆:NH₄=2:1:2. A study by the same method of the partition of Na between the 2 acids gave identical results. The cryst. Na salt was prepd. (1) by direct action of NaOH on the 2 acids; (2) action of MoO₃ on acid Na malate. It is more difficult to purify because much more sol. than the NH₄ salt. Its rotatory power is about that of the NH₄ salt, approx. 200° for yellow light.

A. R. MIDDLETON

Copper-cyanogen compounds. E. MOLES AND R. IZAGUIRRE. *Anales soc. españ. fis. quím.* 19, 33-93(1921).—The reactions between KCN and various Cu salts in aq. soln. were studied by physico-chem. methods. To a known soln. of KCN small successive quantities of the Cu salt soln. were added. Measurements of cond., density, viscosity, and f. ps. were made and plotted against the ratio Cu:CN in every case. Sep. series of curves were made for 0°, 18°, and 25°, resp. The existence of definite

compds. is deduced from the occurrence of discontinuities or angles in the curves obtained. At 0° the curves show the formation of 3 compds.: $K_2Cu(CN)_4$, sol. and colorless; $K_2Cu[Cu(CN)_4]$, sol., violet; and $CuCu(CN)_4$, insol., yellow. The curves at higher temps. have different forms, indicating extreme instability of these compds., which, even when prep'd. at 0°, decompose when kept, forming $CuCN$. The formula of the yellow ppt. was confirmed by analysis and cond. measurements on the first of the compds. mentioned, prep'd. from it by reaction with the proper amt. of KCN soln. The measurement of cond., working at 0°, is suggested as a basis for the rapid volumetric *estn.* of Cu , since a well defined max. occurs in the resistance curve at the ratio $Cu:2CN$. The anions of the Cu salts used were found to exert no influence on the reactions studied.

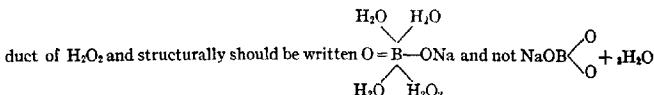
L. E. GILSON

Action of sodium carbonate on solutions of chrome alum. L. MEUNIER AND P. CASTE. *Compt. rend.* 172, 1488-90 (1921).—The expts. described indicate 2 distinct phenomena in the aging of chrome sulfate solns. Increasing amts. of Na_2CO_3 are required to produce a ppt. as the soln. ages until a max. is reached which appears to correspond exactly to the min. of cond. observed by Senechal. Reaction of the $Cr(OH)_3$ formed by hydrolysis with $Cr_2(SO_4)_3$ to form a less ionized complex is believed to be the first stage; slowly progressing hydrolysis with consequent increase of ionic concn. caused formation of granules of $Cr(OH)_3$ too large to enter the complex and flocculated by increasingly smaller quantities of Na_2CO_3 . *C. A.* 15, 2210. A. R. MIDDLETON

The acid and alkaline decomposition of potassium cyanide, with a note on the determination of formic acid in the presence of hydrocyanic acid. GEORGE HARKER. Univ. of Sydney. *J. Soc. Chem. Ind.* 40, 182-51 (1921).—II. finds that at atm. pressure and with application of heat, the evolution of HCN by adding 1 to 1 H_2SO_4 to it, or by adding the KCN soln. to the acid, is only a small proportion of the theoretical yield. Working under diminished pressure and room temp. almost theoretical yields of HCN were obtained. The low figures result from the slow hydrolysis of the HCN which takes place both in acid and in alk. soln. Heise and Foote (*C. A.* 14, 1598) have shown that $NaCN$ can be completely hydrolyzed to HCN and $NaCOOH$ by high pressure steam. When cyanide and formate are present together, the cyanide can be titrated with standard $AgNO_3$. An equal vol. of $AgNO_3$ will now bring about complete pptn. of the CN as $AgCN$. The formate can be detd. in the filtrate by titration with $KMnO_4$. The soln. should be made strongly alk. with Na_2CO_3 and warmed before titrating with the $KMnO_4$.

E. G. R. ARDAGH

Sodium perborate. F. FOERSTER. *Z. angew. Chem.* 34, Aufsatzeil, 354-5 (1921).—Evidence is adduced that the perborate is an addition compd. and not a substitution pro-



(1) Over H_2SO_4 or P_2O_5 at ord. temp., better on heating to 50-55°, approx. $3H_2O$ is rapidly lost; the remaining water is given off very slowly along with O_2 . After 2 yrs. over P_2O_5 loss of wt. was only 38.5% ($3H_2O=35.5\%$; $NaBO_3$ requires 46.8%). The residue gave 16.4% active O ($NaBO_2 \cdot H_2O_2 = 17.0\%$; $NaBO_3 = 19.5\%$). If, after removal of approx. $3H_2O$ at 50-55°, the salt is heated to 120° *in vacuo*, it becomes slightly yellow (cf. K_2O_2); when this product is moistened, O_2 is stormily evolved but the soln. still contains active O. This is much decreased if the salt is heated to 150-80° but the residue still revolves O_2 . Heating to 120° gave no pure product but a mixt., chiefly $(NaBO_2)_2O_2$ with some $NaBO_3$, H_2O_2 , and hydrated $NaBO_3$. (2) Both the salt dehydrated at 55° and that heated to 120° when thrown into concd. KI soln. gave only traces of I_2 .

but much O_2 . (3) Another evidence is that in prepn. the yield is greater the more nearly the concn. of OH^- in the soln. approxs. that in equil. with metaborate. While the electrolytic prepn. of perborate suggests by analogy a substitution product of H_2O_2 , the time-current-yield in active O curves were found to be identical in solns. of same $[OH^-]$ from (1) $Na_2B_4O_7$, (2) $NaHCO_3$. In the latter, $Na_4C_4O_6 + 2H_2O \rightarrow 2NaHCO_3 + H_2O_2$. Hence in the former there is no primary anodic formation of $NaBO_2$ but of $Na_4C_4O_6$ as the soln. contains $NaHCO_3$. The small soly. of $NaBO_2 \cdot H_2O_2 \cdot 3H_2O$ permits removal of $\frac{1}{2}$ of the H_2O_2 from its 0.5% soln. in cryst. and very stable form and can be used technically with the cathodic reducton of O_2 to H_2O_2 first observed by Traube (D. R. P., No. 302,735). A. R. MIDDLETON

Lead acetate complexes. R. WEINLAND. *Z. angew. Chem.* 34, Aufsatzeil, 354 (1921).—W. has succeeded in proving that $(AcO)_2Pb$ forms complex ions by substituting ClO_4^- for AcO^- in the complexes. The following compds. have been isolated:

$Na \left[Pb \left(AcO \right)_2 \right] ClO_4^-$; $Na \left[Pb_2 \left(AcO \right)_4 \right] ClO_4^-$. These are the first known perchlorate anions.

Polynuclear complex cations: $[Pb_2(AcO)_4]ClO_4$; $[Pb_3(AcO)_4](ClO_4)_2$; $[Pb_3(AcO)_6]ClO_4$. It is not yet certain that all the AcO groups belong to the cation. A salt apparently with both ions complex: $[Pb_4(AcO)_4](Pb(ClO_4)_4) \cdot 3H_2O$. *Water-soluble, basic perchlorates, 3Pb(ClO₄)(OH)₂H₂O, Pb₃(ClO₄)₂(OH)₄.* Most of these salts cryst. well; some can be recrystd. unchanged from water. Although stable toward percussion and friction, they first darken, then explode violently, when heated above their m. pts. In this preliminary statement methods of prepn. and analytical data are not given. A. R. M.

Titanium peroxide. MAURICE BILLY. *Compt. rend.* 172, 1411-2 (1921).—Expts. are described which indicate that the pertitanates are complex compds. of H_2O_2 with pertitanates corresponding to Ti_2O_6 and not to TiO_3 as generally assumed. Fifty g. of titanic acid-hydrate were dissolved in 100 cc. concd. H_2SO_4 and 40 cc. water and dild. to a 10% soln., twice the amt. of K_2CO_3 was added necessary for $K_2SO_4 \cdot Ti(SO_4)_2$, then twice the H_2O_2 necessary for TiO_2 . On evapn. below 15° K_2SO_4 sepd. first and was removed; a mixt. of orange and pale yellow crystals then deposited, which upon washing with ice water gave an orange liquid and nearly colorless crystals of $K_2SO_4 \cdot TiOSO_4$. In the orange liquid Ti and active O corresponded to $Ti_2O_{4.75}$ or $2TiO_2 \cdot 1.5H_2O_2$. When the orange salt is repptd. from ice water by EtOH, the mother liquor contains H_2O_2 . Equimol. quantities of K_2SO_4 and $TiOSO_4$ were dissolved separately in the least possible H_2SO_4 1:5 and thrown into 100 vols. of soln. of H_2O_2 contg. 50% more than necessary for TiO_2 , EtOH added and the ppt. washed with EtOH to removal of most of the H_2SO_4 . The dried salt was dissolved in ice water, only a small residue, not peroxide, remaining, and the soln. dild. to 5 l. per 1 g. of TiO_2 . After 10 hrs. at 15-20° much bright yellow hydrate of Ti peroxide sepd. without evolution of any O_2 . The ppt. was washed with water until the washings no longer decolorized $KMnO_4$, then dissolved in H_2SO_4 1:5 to an orange liquid. In this TiO_2 active O was always 9.9-10.15. An insol. pertitanic phosphate was obtained by mixing solns. of Ti acid sulfate, Na phosphate and H_2O_2 and pptg. by addn. of $AcONa$. On washing the ppt. lost O; leaving the ppt. in its mother liquor and measuring the uncombined H_2O_2 in the latter, the combined H_2O_2 corresponded to $TiO_{4.25}$ or $2TiO_2 \cdot 3H_2O_2$. A. R. MIDDLETON

The reactions between hydrogen peroxide and perchromic, perphosphoric, pervanadic, and perbenzoic acids. A. RIUS Y MIRÓ. *Anal. soc. españ. fis. quím.* 18, 35-43 (1920).—In each case reduction occurs with slow evolution of O. The amt. of O liberated is somewhat variable, making the formulation of a definite equation for the reaction impossible except in the case of monoperphosphoric acid. Here the reaction is definite according to the equation: $H_3PO_4 + H_2O_2 = H_3PO_4 + H_2O + O_2$. L. E. G.

Double salts of the system, $H_2O \cdot NaCl \cdot Na_2SO_4 \cdot MgCl_2 \cdot MgSO_4$ at 105°. TSUT-

OMU MAYERDA. *J. Chem. Ind. Japan* 23, 954-6(1920).—M. analyzed 2 double salts D_1D_2 (cf. the equil. curve in *C. A.* 15, 791). From 3 different methods of analysis, D_1 is found to be $2Na_2SO_4 \cdot 2MgSO_4 \cdot 5H_2O$, and D_2 , $3Na_2SO_4 \cdot MgSO_4$.
S. T.
Colloidal sulfur compounds of ruthenium. F. M. JAEGER AND J. H. DE BOER. *Rec. trav. chim.* 40, 162-8(1921).—See *C. A.* 15, 349. E. J. WITZEMANN

Existence of compounds in liquid mixtures (JORISSEN) 2.

7-ANALYTICAL CHEMISTRY

WILLIAM T. HALL

Ammonium sulfate saltpeter. HERMANN ULEX. *Chem. Ztg.* 44, 876(1920).—In the examn. of 4 samples of $(NH_4)_2SO_4$ saltpeter, the N content as detd. by the method of Arnd was found about 0.5% below the value obtained by the method of Ulisch.

W. T. H.

The determination of nitrogen in ammonium sulfate saltpeter. TH. ARND. *Chem.-Ztg.* 45, 537(1921).—The results of 20 comparative analyses are given to show that the results obtained by the classic method of Ulisch are practically identical with those obtained by the new Cu-Mg method of Arnd.

W. T. H.

Determination of chlorine, sulfur, and phosphorus in organic substances. A. GRÉGOIRE AND E. CARPIAUX. *Bull. soc. chim. Belg.* 28, 331-5(1919).—The method, which is designed for use with plant products, consists in digesting the material with concd. HNO_3 and a little $KMnO_4$ in a distn. flask, the exit tube from which passes through a short condenser. At its lower end the exit tube is connected with the absorption device, which consists of two inclined tubes, 18-22 mm. diam., and about 1 m. long, arranged crosswise and joined by a connecting tube. To improve the contact between the absorbent and the vapors, pieces of glass tubing are placed in the inclined tubes, each piece being drawn out at one end, which projects into the end of the next higher piece of tubing. The S and P remain in the distn. flask as sulfuric and phosphoric acids, while the Cl distills off along with nitrous fumes, and is collected in water as HCl . The three acids are then estd. in the usual way. J. S. C. I.

Detection of very small quantities of beeswax in admixture with mineral oil and colophony. A. JOLLES. *Oel- u. Fettind.* 2, 207, 231-2(1920).—Comparative expts. were made with mixts. of which one contained 70% of colophony and 30% of mineral oil and the other 67% of colophony, 30% of mineral oil, and 3% of yellow beeswax. The sapon. values of the original mixts. proved useless for the detection of beeswax. By extn. with cold 70% alc., however, the colophony was removed, and the residue in the case of the wax-free mixture gave sapon. and acid values of practically 0, while in the other case the sapon. value was 8.41, the acid value 1.70, and the Hübl I value 3.94, the calcd. values being 8.46, 1.80, and 3.67 resp. It was found possible to sep. the wax from the mineral oil by means of petroleum ether, in which the former is insol.

J. S. C. I.

The rare sugars; their purity and tests. CARL PFANSTIEHL AND ROBERT S. BLACK. *J. Ind. Eng. Chem.* 13, 685-7(1921).—The general tests described include tests for heavy metals, Ca and Al, sulfate, chloride, acidity, alc., ash, moisture, solv., and sp. rotation. The characteristic consts. of *L*-arabinose, dulcitol, erythritol, *d*-galactose, *d*-glucose, glycogen, inositol, inulin, lactose, *d*-levulose, maltose, *d*-mannitol, *d*-mannose, perseitol, raffinose, rhamnose, sorbitol, sucrose and xylose are given.

W. T. H.

The standardization of rare sugars. HOWARD T. GRABER. *J. Ind. Eng. Chem.* 13, 687-8(1921).—The routine analytical procedure for examg. sugars for sp. rotation, color, moisture, ash, solv., alc., chlorides, sulfates, alkaline earths and heavy metals

as well as their behavior toward litmus, methyl red and phenolphthalein is described as carried out in the lab. of the Digestive Ferments Co.

W. T. H.

Determination of sulfur dioxide in gases from roasting. E. BERL. Tech. Hochschule, Darmstadt. *Chem. Ztg.* 45, 693(1921).—The absorption of SO_2 in NaOH from gases contg. both O and SO_2 is quant. inaccurate. This is due to oxidation of SO_2 to a sulfate before the soln. can be analyzed. Titoff (*Z. physik. chem.* 27, 585(1898)) has shown that the rate of oxidation is influenced by both positive and negative catalysts. Data are given to illustrate the varying results with different catalysts and to demonstrate the utility of SnCl_2 . $\text{Na}_2\text{SO}_4 \cdot 7\text{H}_2\text{O}$ analyzing 25.53% SO_2 was decompd. and the SO_2 absorbed under varying conditions and analyzed by iodimetry. The following percentages were calcd. from absorption of SO_2 : directly in I soln., 25.63%; NaOH alone, 24.36%; NaOH alone but vigorously shaken, 20.21%; NaOH with CuSO_4 , 16.81%; with 0.0002 mol. SnCl_2 , 25.10%; with 0.0005 mol. SnCl_2 , 25.29%; with 0.001 mol. SnCl_2 , 25.54%; with 20% $\text{C}_6\text{H}_5(\text{OH})_3$ by vol., 24.92%; with 50% $\text{C}_6\text{H}_5(\text{OH})_3$, 25.41%. The use of an absorption soln. contg. 0.23 g. of $\text{SnCl}_2 \cdot 2\text{H}_2\text{O}$ per 1000 cc. was found to render the analysis of SO_2 by absorption in NaOH exceedingly accurate.

C. C. DAVIS

The quantitative determination of gold by cupellation and the examination of large amounts of gold destined for the manufacture of money. J. W. A. HAAGEN SMR. *Rec. trav. chim.* 40, 119-52(1921).—The assaying of Au is not only the oldest known quant. analytical detn. but has remained unchanged in principle for centuries, at least from the time of Philippe de Valois in 1343. S. has examd. the entire process critically and the details are here more fully given than can be adequately abstracted. The author's own summary follows: All of the known rules were examined even to the smallest details. The principle point of the detn. is not the furnace but the intensity of the draft. Uniformity in the access of air is necessary and too rapid cupellation is injurious but for the rest great personal liberty is permissible. The ratio Pb:Cu ought to be 55:1 but there is little inconvenience if it goes beyond this level. For Au containing Cu the line of Pb-Au loss, on the side of the minimum, is a curve which is strongly influenced by the temp. The roasting of the button after the "blick" is necessary for Au of commerce and then the ratio 2Ag:1 Au is excellent. The cornet ought to be well roasted both before and after the boiling. Thin sheets (0.15 mm.) are to be recommended especially since they favor the extraction in the acid. The Cu content of the tests and the blanks ought to be exactly the same. S. has given a more precise explanation of the nonappearance of the "blick" at times. Three kinds of cupel were examined quant. The surface and porosity do not play any role, but the thermal cond. does. The HNO_3 used for parting ought to be absolutely free from Cl and more concd. than is usually used. Large tests up to 20 g. give good results if the buttons are cleaned, and the strips are cut in pieces which are roasted well and rinsed at intervals. The balance and wts. ought to be verified from time to time. This 4 century old method remains essentially unchanged and thanks to improvements that have been brought about, it is with Gay Lussac's method for titrating Ag the most accurate in analytical chemistry.

E. J. WITZEMANN

Platinum-gold determinations in the dry way. PROSKE. *Metall u. Erz* 18, 383 (1921).—The Au-Ag-Pt alloy is parted with H_2SO_4 and the resulting Au-Pt-Ir residue treated with aqua regia; the residue is Ir. The Au in the solution is ptd. with FeCl_3 and weighed. The Pt is obtained by difference.

R. S. DEAN

Sampling of noble metal containing material in the form of alloys, slags, slimes, etc. PROSKE. *Metall u. Erz* 18, 382(1921).—An error-free sample can only be obtained from a noble metal alloy in the molten state. Where the amt. of sample is small or the alloy over 700 fine the bar may be sampled by boring. This should be done by boring half

way through from each side in several different positions. Slags and residues if homogeneous may be satisfactorily sampled by boring. This should be done by boring half way through from each side in several different positions. Slags and residues if homogeneous may be satisfactorily sampled by coning and quartering. If wet, part of the sample should be dried at 105° and the moisture content calcd. Non-homogeneous material is ground in a ball mill and sieved; any metal particles are removed and melted and a sample is taken, as with alloys. Any iron from the ball mill is removed with a magnet.

R. S. DEAN

Sulfur in malleable cast iron. LESTER C. CROME. *Chem. Met. Eng.* 25, 247-8 (1921).—The evolution method for detn. of S often fails to give total S due to the fact that some S is lost during the annealing process. When total S in white cast Fe is not obtained by evolution method it must be present in two distinct forms. That obtained is undoubtedly MnS and FeS; the other is probably evolved as a gaseous compd., and does not have the same deleterious effects as the sulfides. Because of this it is assumed to be subsequently lost during annealing.

W. A. MUDGE

Reagent chemicals. I. Proposed specifications for sulfuric, nitric and hydrochloric acids, and for ammonium hydroxide (COLLINS) 2. The saccharorefractometer (DILC) 11B. Acid and alkaline decomposition of potassium cyanide and determination of formic acid in presence of hydrocyanic acid (HARKER) 6.

8—MINERALOGICAL AND GEOLOGICAL CHEMISTRY

EDGAR T. WHERRY AND WALTER F. HUNT

Corundum. A. L. HALL. Geol. Survey, *Mem.* 15, (1920) (Dept. Mines and Industries Union of S. Africa); *Bull. Imp. Inst.* 19, 93-4 (1921).—The Transvaal corundum deposits are said to be the largest and most important yet discovered. It is concluded from the geological relationships that the corundum has originated from an excess of Al_2O_3 occasioned by some of the SiO_2 in pegmatites of granitic origin being abstracted by the basic rocks into which the pegmatites have been intruded. R. L. S.

Magnesite. A. G. MAITLAND. W. Australia Geol. Survey, *Mem.* No. 1; *Bull. Imp. Inst.* 19, 100-1 (1921).—Analyses of 8 samples of magnesite from 5 different deposits in W. Australia show MgO from 44.31 to 47.36% and CO_2 from 47.76 to 51.69%. The magnesite is found on the surface as an alteration product of serpentinized rock.

R. L. SIBLEY

Vanadium. M. FERGUSON AND P. A. WAGNER. *S. African J. Industries* 3, 1058 (1920); *Bull. Imp. Inst.* 19, 108-9 (1921).—Deposits of vanadinite occurring with galena in decomposed Mn-bearing earth are described. The theory is advanced that the galena was introduced by mineralizing solns. that spread along the bedding planes of the dolomite. Later the dolomite was altered to Mn earth through the agency of meteoric waters. The formation of the vanadinite appears to be connected with this later alteration. Seven samples contain from 8.15 to 15.5% Pb and from a trace to 1.35% V_2O_5 .

R. L. SIBLEY

X-ray analysis of adularia and moonstone, and the influence of temperature on the atomic arrangement of these minerals. S. KŌZU AND Y. ENDO. *Sci. Reps. Tōhoku Imp. Univ.* [III] 1, 1-17 (1921).—As the Swiss adularia and Ceylon moonstone differ more in ns. and other properties than could be accounted for, were they identical as often supposed, new analyses were made by K. Seto of 2 crystals of adularia and 1 of moonstone, all studied optically. They proved to differ in relative alkali content, adularia having Na_2O 0.97, 1.12, K_2O 14.01, 14.70, while the moonstone yielded Na_2O 2.62, K_2O 12.06. The corresponding norms include *Ab* 8.3 and 9.3 for the first, but 23.1.

for the second mineral. Work on orthoclase (*Or*) has indicated that it is only of limited miscibility with albite (*Ab*), the limit of *Ab* in *Or* being 10%, or *Or* in *Ab* 8%. The moonstone therefore should show dissoc., with sepn. of considerable *Ab*; but it shows no perthitic structure, only schillerization. Laue X-ray diagrams were made of the 2nd specimen of adularia, which proved to show normal symmetry; of the moonstone at ordinary temp. which also showed normal symmetry but had many of the circles of spots doubled, clearly indicating the presence of 2 different systems of atoms; a moonstone from Korea also gave doubled spots, but these showed in a different crystallographic direction. Laue diagrams were then made of material treated at high and at low temps. The adularia kept at 1080° for 1 hr. and quenched in Hg showed no change in pattern. Moonstone up to about 500° showed no change in the positions of its spots, but at higher temps. the 2 rings of spots approached one another and between 1060° and 1115° became coincident. At still higher temps. the usual change of spots connected with melting occurred. Modifying the rates of cooling also showed an effect on the spots, and evidence of a transition point for the monoclinic Na feldspar at 700° was obtained. Cooling in liquid air produced no essential changes in the spots. The schillerization is clearly not due to inclusions or twinning lamellas; it was found to disappear when the Laue spots coincided at the higher temps., and is concluded to be the result of the interference of light rays, caused by a special manner of arrangement of the planes in the space lattice.

E. T. W.

Optical, chemical and thermal properties of moonstone from Korea. S. Kōzu AND M. SUZUKI. *Sci. Repts. Tōhoku Imp. Univ.* [III] 1, 19-23 (1921); cf. preceding abstr.—The mineral weathers from a liparitic rock; its crystals are 2-10 mm. long, and rich in faces. The *ns*. were detd., and found to vary from the outer to the inner portions of the crystals. Analysis of transparent fragments of a small homogeneous crystal by K. Seto gave: SiO_2 65.97, Al_2O_3 18.60, Fe_2O_3 0.81, MgO none, CaO 0.99, K_2O 9.63, Na_2O 3.52, sum 99.52%; this corresponds to the norm in mol. %, *Or* 61.0, *Ab* 33.7, *An* 5.3. The Korea moonstone is thus much more sodic than that from Ceylon. The X-ray studies described in the preceding abstract showed in fact that there was a difference in the crystallographic directions of doubling of Laue spots in the 2 minerals. Heat treatment shows that the Korean moonstone exhibits coincidence of the spots at a lower temp. than the Ceylon., namely even below 790°. The solidus was found to occur at 1100°, liquidus at 1213°. The schillerization disappeared at the same temp. as the Laue spots coincided, and is undoubtedly due, as in the Ceylon mineral, not to inclusions and cavities as has been supposed, but to the peculiar arrangement of the planes of the 2 substances in the space lattice.

E. T. W.

Sanidine from the Eifel. S. Kōzu AND K. SETO. *Sci. Repts. Tōhoku Imp. Univ.* [III] 1, 25-32 (1921).—In a previous article (*C. A.* 10, 1738) K. described optical relations of this feldspar. A crystal has now been analyzed and found to have the compn.: SiO_2 66.11, Al_2O_3 18.63, Fe_2O_3 none, MgO 0.12, CaO 0.25, Na_2O 2.52, K_2O 12.71, sum 100.34%. This corresponds to the norm in mol. %, *Or* 75.9, *Ab* 22.8, *An* 1.3. It is noteworthy that this feldspar approaches the Ceylon moonstone (cf. 2 preceding abstracts) in *Ab* content. It shows however no schillerization and no doubling of spots in the Laue diagram as published by Rinne (*C. A.* 11, 1358, 3169). It therefore apparently represents a homogeneously mixed solid soln., although it does exhibit a peculiar optical property, easily variable axial angle. On heating the solidus p. was found to be 1160°, the liquidus 1270°, both about 50° higher than the Ceylon moonstone. The relations between its E_t and E_λ curves are discussed mathematically in detail, and it is found possible to predict $2E$ satisfactorily for different temps. and wave lengths. E. T. W.

Ontario's mineral wealth. W. R. ROGERS. *Can. Chem. Met.* 5, 281-3 (1921).

E. J. C.

The economic situation of iron-ore mining in Latin America. D. E. A. CHARLTON. *Eng. Mining J.* 112, 454-8 (1921). E. J. C.

Notes on the presence and origin of the petroleum of Argentina and Bolivia. ROBERT ANDERSON. *Anales soc. quim. Argentina* 8, 1-13 (1920).—The petroleum is found in various strata from the Devonian to the Tertiary. It is believed to have been formed from the remains of marine organisms. L. E. GILSON

Some American dolomites. BURLEIGH B. REED AND NICHOLAS KNIGHT. *Proc. Iowa Acad. Sci.* 26, 377-8 (1919).—Typical specimens of rock used for building stones in their respective localities were obtained in order to make a comparison of their chem. compns. Following are results of analyses: (1) From Mt. Vernon, Iowa; Niagara formation; yellowish gray, due to Fe. SiO_2 1.29, $\text{Fe}_2\text{O}_3 + \text{Al}_2\text{O}_3$ 0.57, CaCO_3 55.17, MgCO_3 43.04, sum 100.07%. (2) West Chester county, New York; a typical dolomite not materially different from the Iowa rock. SiO_2 2.71, $\text{Fe}_2\text{O}_3 + \text{Al}_2\text{O}_3$ 1.05, CaCO_3 53.43, MgCO_3 42.93, sum 100.12%. (3) Lockport, New York; Niagara limestone. SiO_2 2.76, $\text{Fe}_2\text{O}_3 + \text{Al}_2\text{O}_3$ 1.42, CaCO_3 51.85, MgCO_3 43.94, sum 99.97%. This contains a sufficiently high % of MgCO_3 to class the rock as a fairly typical dolomite. (4) Milk-white crystals encrusting the foregoing specimen: SiO_2 0.18, $\text{Fe}_2\text{O}_3 + \text{Al}_2\text{O}_3$ 1.21, CaCO_3 81.62, MgCO_3 17.15, sum 100.16%. This deviates widely from a true dolomite, as the Ca has quite largely replaced the Mg. (5) Betram, Iowa, between Mt. Vernon and Cedar Rapids. The rock is gray in color, with numerous light-colored crystals disseminated through it. Former analytical data seemed to indicate that the Mg content of the rock was in excess of the Ca, but the new work shows this to have been erroneous: SiO_2 0.90, $\text{Fe}_2\text{O}_3 + \text{Al}_2\text{O}_3$ 0.90, CaCO_3 55.61, MgCO_3 42.58, sum 99.99%. The figures indicate a rather typical dolomite, as one would naturally expect from similar formations in the neighborhood. W. G. GAESSLER

9—METALLURGY AND METALLOGRAPHY

D. J. DEMOREST, ROBERT S. WILLIAMS

Secure place of the iron blast furnace. JOSEPH F. SHADGEN. *Iron Age* 108, 465-7 (1921).—A discussion of the relative merits of the iron blast furnace and the newer direct reduction methods. The blast furnace has come to stay. H. C. PARISH

Methods of preparing blast-furnace slag. ANON. *Iron Age* 108, 461-3 (1921).—Four general classes of slag are mentioned: air-cooled bank slag, fork slag, pancake slag and honeycomb slag. Air-cooled bank slag is prep'd. by running the molten slag into huge slag ladies in which it is carried in the liquid condition sometimes 8-10 miles to the spoil bank. Here it is seasoned. It is then excavated, and finally crushed and screened for the market. Fork slag is made by running the molten slag from the furnace into long narrow trenches in sand. When cool enough to handle, it is broken up, hauled to the dump, seasoned, etc. This slag carries some sand and is used for mass concrete, road work, etc. Pancake slag is made by casting the molten slag in machines similar to a pig-casting machine. The pan travels to cars on a conveyor, being cooled and broken in transit by sprinkling with water. Honeycomb slag is made by pouring into a tank a layer about 6" thick, cooling, spraying with water, cleaning and drying. Then another 6" layer is poured on top and so on until the tank is filled. It is then excavated, crushed and graded by screening. H. C. PARISH

Heat balance of a blast-furnace stove. D. W. WILSON. *Chem. Met. Eng.* 25, 200-2 (1921).—Tests were made on a two-pass, side-combustion set of stoves, 110 ft. high by 22 ft. external diam. The time ratio of heating and cooling was 3:1, as four stoves were used in sequence. Exptl. and calcd. data are given which show an efficiency of 62% in these stoves. The heat output in percentage of heat input is distrib-

uted as follows: heating value in flue gas 15.6, heating air for combustion 0.7, uncondensed water from hydrogen combustion 2.3, heat removed by air blast 62.0, cooling water for valves 2.6, radiation loss 10.1, unaccounted for 6.7. A. W. OWENS

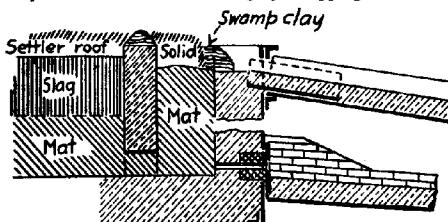
Some points in the design of blast-furnace gas cleaners. N. H. GELLERT. *Chem. Met. Eng.* 25, 287-8(1921); cf. *C. A.* 14, 695.—G. recommends that the condition of the gas as to velocity and vol., dust content, moisture content and temp. be first detd. Velocity is best detd. by means of a standard type Pitot tube inserted in a straight section of the gas main free from obstructions for 4-10 times its diam. Under normal conditions the following formula applies to blast-furnace gases: $V=2.9\sqrt{TH}$, where V is the gas velocity in ft. per sec., T is temp. in degrees. F.+460, and H is the velocity head in inches of water. In Europe dry cleaners have been used, but they are objectionable on account of high cost, danger of burning and loss of sensible heat in cooling the gas sufficiently to pass the bags safely. The problem of screening the dust and fume out of blast-furnace gas is difficult because of the variation in the size of the particles. For furnaces working with a hot top, as a ferromanganese furnace, cooling is absolutely necessary before dry cleaning, and should be done by water passing through tubes, as direct cooling by water would introduce too much water vapor into the gas. A. W. OWENS

Blast furnace for zinc. EVANS W. BUSKETT. *Eng. Mining J.* 112, 409-10(1921).—Owing to the less volatile nature of Zn under pressure, B. proposes to smelt Zn ores in regular blast-furnace fashion, the whole operation being carried on under pressure.

W. A. MUELLER

Is moist air desirable for copper blast furnaces? JULIUS H. GILLIS. *Mining Eng.* J. 112, 250(1921).—In a Cu-Ni blast-furnace smelting raw pyrrhotite ore with converter slag as flux, enough steam was added to the blast just to sat. the air in the blast-main at 21°, equiv. to 300 lb. of steam per hr. In 2 days' run there resulted an increased tonnage of charge smelted of 147 tons per day, or 13.8%, over the av. of the previous 5 days, other conditions remaining unchanged. This record was never equalled in any other way, even by increasing the coke. Other tests with steam gave similar results, unless the amt. used was too large. A. BURRS

Inverted siphon tap for mat settler. JULIUS H. GILLIS. *Eng. Mining J.* 112, 300-1(1921).—At the Cu-Ni smelter of the British America Nickel Corp., near Sudbury, Ont., large quantities of mat of but little over 10% Cu-Ni were made. As such mat is highly corrosive, frequent break-outs from the settler occurred, and much labor was required in repairs to the settler and changing of tapping blocks. The arrangement



Section Through Well and Launder

shown was then put in, with very satisfactory results. The mat was forced under the arch, and would rise in the well nearly to the level of the slag. When it was desired to tap, the clay in the overflow was broken away and the slag overflow stopped, and the mat was forced out at about the rate of the combined slag and mat flow from the furnace spout. When enough had been tapped, the slag overflow was opened, the mat almost

stopping of its own accord. A chunk of swamp clay was then dropped in and tamped down. Trouble was seldom experienced in starting the flow, even though no tap had been made for 24 hrs. previously. An unskilled helper could easily make a tap. A. B.

Should copper blast furnaces be bricked up to the tuyères? F. K. BRUNTON. *Eng. Mining J.* 112, 404-5(1921); cf. preceding abst.—B. finds that building up of the bottom toward the tuyère line increased tonnage of mat. No reasons are stated.

W. A. MUELLER

Metallurgical progress in Shasta County, Calif. GEORGE J. YOUNG. *Eng. Mining J.* 112, 286-90(1921).—A general description and historical sketch of development of Cu and Zn operations. A. BUTTS

Construction of new roasting furnaces. ANON. *Chem.-Ztg.* 45, 429-30(1921).—A comparison is made of the installation and operation costs of large and small roasters and the advantages and disadvantages of cooling systems and adaptation to materials are discussed. The construction, with drawings and operation of wasters of the Erzröst-Gesellschaft M. B. H., Köln a Rh., is described, and 14 advantages of these furnaces are given.

W. A. MUELLER

Jibbinbar State Arsenic Mine. Health of the employees. ANON. *Queensland Govt. Mining J.* 22, 296(1921).—All the underground men stated that there was no injury to their health. The As_2O_3 is recovered from the ore in a furnace at the mine, and among the furnace men there were some minor troubles from As, such as conjunctivitis and infection of cuts. Masks, gloves, etc., are used, but the men are very careless about them.

A. BUTTS

Use of cupolas in open-hearth practice. V. W. AUBEL. *Iron Age* 108, 403-5(1921).—A treatise in favor of using cupolas in conjunction with the basic open-hearth steel process for the premelting of pig iron where there are no blast furnaces, showing the cost of operation and the general procedure in adapting the cupola for heavy duty. The metal from the cupola is always ready while it is often necessary to wait 4 hrs. for the hot metal from the blast furnace. The process more than pays for itself by increased production.

E. G. JARVIS

Calcium silicide—a new deoxidizing agent. W. S. ANDERSON. *Raw Material* 4, 51-2(1921).—CaSi₂ performs 2 principal functions when added to a molten bath of iron or steel: (1) as a deoxidizing agent, (2) as a reheater. In performing function (1) it combines with O forming CaSiO₃, which rises to the top of the bath in a manner similar to all slags and leaves no harmful inclusions in the metal. The reaction is extremely vigorous, hence, its reheating power. The finished product possesses a greater degree of soundness with the elimination of gas pockets. The material should be added in the form of powder in several small paper packages to the molten stream of metal as it is run into the ladle. If too large portions are added at one time the reaction is too vigorous. Ten-20 oz. per ton is recommended for steels whose C content does not exceed 0.30% and 30 oz. per ton for C contents from 0.30 to 0.50%. General results have shown an increase in (a) tensile strength of 5000-7000 lbs., (b) elastic limit of 3000-4000 lbs., (c) elongation of 20-30%, (d) reduction in area of 30-50%. H. C. PARISH

Non-ferrous applications of vanadium. KIRBY THOMAS. *Raw Material* 4, 167-8 (1921).—After reviewing the history of V, T. discusses its non-ferrous uses. Approx. 100 tons of cupro-V are now being sold annually to brass and bronze makers. This alloy contains 8-12% V and was used successfully during the war for aeroplane propeller bushings. It has also been used in boat propellers, it being claimed that it has special strength and non-corrosive qualities. An Al-V alloy, contg. about 10% V, is available and has been used to stiffen Al framework in aeroplanes, in piston rings, gearboxes and elec. equipment. An Al-Mn-V compd. has been used in the manuf. of special bronze castings and as a source of Mn and V in Al alloys. The principal use

of V in non-ferrous alloys has been as a substitute for Mn in bronze. V bronzes show a higher tensile strength, elongation and reduction in area than the same mixt. in which Mn has been used. V bronze has been used extensively in submarine construction and for gears and pinions in marine work, and is listed in U. S. Navy specifications. A V bronze cylinder 3" in diam., 15" long and having a $\frac{1}{16}$ " wall withstood successfully a 9000 lb. water pressure. Aside from its use in non-ferrous metallurgy, V has found application as a catalytic agent in H_2SO_4 manuf., and as the chloride in the textile industry. It has also been used in V-salve, especially for burns, and in toning $AgBr$ prints to a green color.

H. C. PARISH

Fuel requirements of steel mills. F. E. LEAHY. *Assoc. Iron and Steel Elec. Eng.* 3, 427-35(1921).—L. discusses in general the role of coal, coke, natural gas, by-product coke-oven gas, producer gas, blast-furnace gas and oil fuel in blast furnaces and steel mills, and he points out the factors to be considered in purchasing and selecting coal.

E. G. R. ARDAGH

Metallurgist and the tractor. C. S. MOODY. Minneapolis. *J. Soc. Automotive Engineers* 9, 189-92(1921).—M. discusses materials and metallurgical problems in the construction of tractors.

C. J. WEST

Hardness testing. F. WAIZENEGGER. *Z. Ver. deut. Ing.* 65, 824-7(1921).—If the Brinell hardness numbers detd. at many pressures be plotted against their corresponding pressures, a curve is obtained which has the same shape as the familiar stress-strain diagram. W. adopts the max. hardness number ($H_{max.}$) read from this curve as an index to compare the hardness of different metals. $H_{max.}$ is independent of both the pressure applied and the diam. of the ball. W. derives mathematical formulas for the calcn. of $H_{max.}$ from the data secured from 2 hardness detns. made at different pressures.

F. P. FLAGG

Physics of steel. WM. R. WEBSTER. *Blast Furnace and Steel Plant* 9, 555-63 (1921).—A general discussion and the application in rolling of the effects of C, P and Mn on the mechanical properties of steel.

V. O. HOMERBERG

Universal steel classification code. HORACE C. KNERR AND ARTHUR L. COLLINS. *Iron Age* 108, 515-17(1921).—The present system of steel classification is believed to be limited in scope, arbitrary rather than scientific and not inherently capable of consistent expansion. The original simple plan is already outgrown, the proposed further expansion tends to complication. Examples of inconsistencies are shown. A scientific system capable of unlimited expansion is needed. Symbols should be consistent and should suggest material represented, aiding the memory. A straight number system is necessarily limited. A combined letter and number system is suggested, which is mnemonic, simple and truly elastic, and which indicates both materials and their approx. quantities, if desired, without complication. Illustrations of the proposed system are given.

V. O. HOMERBERG

Macroscopic examination of iron and steel. ANON. *Chem. Met. Eng.* 25, 334-5 (1921).—Tentative methods are given for testing Fe and steel as proposed by a committee on metallography, appointed by the Am. Soc. for Testing Materials. The soins. for macroscopic etching and the methods for indicating the distribution of S are considered.

V. O. HOMERBERG

Cross section measurements of steel ingots for forging bars. F. PACHER. *Stahl u. Eisen*, 41, 913-9(1921).—Nothing new is given.

R. S. DEAN

Manufacture of drill steel from hollow ingots. ANON. *Iron Age* 108, 596-8 (1921).—A description is given of the method employed by the Ludlum Steel Co. in the manuf. of hollow drill steel. A high-grade low-C mild steel tube, suitably cleaned by sandblast, is inserted into an ingot mold and then the hot metal is cast around this tube. The following claims are made as to the superiority of the tube method over the

older methods: (1) greater freedom from external and internal straining; (2) because of the inherent small crystal size; (3) absence of harmful segregation resulting in weakness of the wall of the hole; (4) less liability of the steel to crack in the inside of the hole during forging or hardening; (5) toughening effect, arising from the mild steel wall of the hole, limiting the intense hardening on quenching.

V. O. HOMERBERG

Embrittling effect of pickling upon carbon steel. GEO. F. COMSTOCK AND A. B. WILSON. *Iron Age* 108, 685-6 (1921).—C. and W. caution against false conclusions and erroneous impressions that can be drawn from inferior metallographic work as the result of overetching and improper focussing. Two strips of an ordinary low-C black sheet were cut side by side and 1 was pickled in 5% H_2SO_4 by vol. for 10 min. at 80 to 85°. Three bending tests were made in each of 2 directions at right angles on each of these sheets. The pickled sheet endured an av. of 5.7 bends before failure, the other 7.7 bends. Pickling, therefore, was shown to have been effective in causing brittleness, which is known to be due to H absorption. The 2 samples gave the same microstructure when etched with HNO_3 for 10 sec. but gave quite different results when etched for 35 sec. and photographed slightly out of focus.

V. O. HOMERBERG

Effect of overheating high-carbon steel. LANCELOT W. WILD. *Blast Furnace and Steel Plant* 9, 541-2 (1921).—Heating steel to the completion of the magnetic change before quenching gives the strongest, toughest, best wearing and best cutting steel. Over-heating gives increased hardness for oil quenching and greater depth of hardness for H_2O quenching, but this is obtained at the expense of all those qualities most desired in hardened steel. Over-heating steel increases the size of the grains, thereby increasing the thermal cond. and reducing the cohesion; hence the deeper hardening power and reduced strength. Large masses can be hardened as perfectly as small masses by heating to the point where the steel becomes entirely non-magnetic.

V. O. H.

A new rail specification proposed. ANON. *Iron Age* 108, 262-3 (1921).—A specification is given for open-hearth steel rails, 80 lbs. to 110 lbs. inclusive per yd., showing a number of changes in the breaking tests, destruction tests, and others. Under details of manuf., a number of changes appear, the most important of which appears under item (b): "The steel must be well deoxidized in the furnace or ladle before the ingots are teemed, and the use of Al in the molds to insure the quiet setting steel desired will not be permitted."

E. G. JARVIS

Internal service-strains in steel. JAMES E. HOWARD. *Chem. Met. Eng.* 25, 275-8 (1921).—H. discusses the effects which forces and movements taking place within the metal itself, between crystals and even between atoms, induced by conditions other than external loading may have upon the successful employment of steel in industry.

E. G. JARVIS

Fatigue of metals. PAUL KREUZPOINTNER. *Eng. Mining J.* 112, 216-7 (1921).—Steel is more sensitive to working stresses than is ordinarily supposed. Continuous vibration produces a weakened condition conducive to sudden fracture. Regular periods of rest promote recovery of the equil. of internal forces and restore original efficiency.

V. O. HOMERBERG

Studied failures of cast-iron wheels. H. J. FORCE. *Foundry* 49, 602-3 (1921).—Recommendations and changes that should be considered necessary in the manuf. of chilled-iron wheels are discussed. The limits of compn. of the metal as detd. by the analyses of a large number of wheels receive special consideration.

V. O. HOMERBERG

Split-head rail failure shows rupture. JAMES E. HOWARD. *Iron Age* 108, 393-5 (1921).—The failure of a rail which caused derailment is described as due to the presence of a split-head fracture. Wheel loads cause distortion of the grain of the steel and induce lateral flow of the metal at the running surface of the rail, the tendency of such loads being to spread the railheads. Successful resistance of such lateral forces depends

upon the structural soundness of the metal in the railhead. Longitudinal streaks are lines of weakness which influence the formation of splithead fractures and locate their incipient points of origin. These streaks are due to casting and milling condition. Split-head fractures are of slow and progressive development. V. O. HOMERBERG

Crack formation in boiler plates. B. STRAUS AND AD. FRY. *Stahl u. Eisen* 41, 1133-7(1921).—Investigation of old boiler plates which have failed showed them to contain strain figures as revealed by etching with Cu chloride. New boiler plates also showed strain figures after bending and beating to 200°. These strain lines are only removed on annealing above Ac_3 . The explanation of crack formation in boiler plates is found in these strain lines and the brittleness which they confer. Boiler plates should be rolled at the highest possible finishing temp. and then annealed at a short period above Ac_3 . Annealing in the finished form would be desirable. The iron used for boiler plates should be low in P. R. S. DEAN

War experiences with the corrosion of condenser tubes and attempts to overcome the difficulties. SCRULZ. *Z. Metallkunde* 12, 49-66(1920).—This is a detailed study of the question of condenser-tube corrosion based on the consideration of the three factors (1) material, (2) operation and (3) construction. The results obtained by the British Alloys Research Committee on Corrosion are discussed as well as numerous other published results. No new exptl. data are given. R. S. WILLIAMS

Influence of fermentation products of bacteria on corrosion in condensers. R. GRANT, E. BATE AND W. H. MYERS. *Commonwealth Eng.* 8, 364-6(1921).—It was noticed that when no particular care was taken completely to drain and dry the tubes of a condenser before a long period of shut-down, tube failures often occurred on starting again even with a condenser which had been immune from trouble. After investigation it seemed that microorganisms were important in causing or starting this corrosion. F. W. TANNER

New heat-treating furnace. ANON. *Iron Age* 108, 665(1921).—The complete equipment consists of the furnace, transformer, automatic control panel and a temp. control instrument that is mounted on the sub-base of the panel. The furnace consists of a sheet steel casting, supported on legs, lined with insulating material and having a semicylindrical chamber. The heating element consists of a continuous strip of resistor ribbon formed into an arch or a succession of semi-circular turns conforming to the arch of the furnace chamber and extending the whole length of the latter, the proper spacing between turns being maintained by means of insulators. A strong winding is thus obtained that is self-supporting and still flexible to expansion and contraction. The heat is radiated directly to the charge. Owing to the absence of a muffle, the temp. gradient will be low. V. O. HOMERBERG

Rotary furnace for automobile parts. A. D. DAUCH. *Iron Age* 108, 666-7(1921).—The moving hearth is in the form of a continuous annular ring, electrically heated and automatically controlled. The furnace is provided with 2 adjacent doors, pneumatically operated, 1 for charging and the other for discharging. V. O. HOMERBERG

Heat treatment of screw stock. A. A. BLUE. *Blast Furnace and Steel Plant* 9, 553-5(1921).—Ordinary cold rolled screw stock of the general compn. covered by the S. A. E. specification No. 1,114, presents nearly all of the undesirable features for a steel to be heat treated. However, by the use of drastic treatments, it is possible to produce appreciable improvements in it. Such material should be used only for parts requiring the least service. V. O. HOMERBERG

Screw stock heat-treated with oil. F. J. RYAN. *Iron Age* 108, 660-1(1921).—An account is given of the application of the Mirs system to ferrous and non-ferrous material by the Bridgeport Screw Co. Operating data are included. V. O. H.

Variation of resistance of nickel steels due to subsequent heating. W. DEL

REGNO. *Atti accad. Lincei* 29, ii, 138-42, 192-4(1920); *Science Abstracts* 24A, 446.—A description is given of the results of expts. on a number of different samples of Ni steels including invar and platinite. It was found that in every case the resistance was changed, after heating, when the metal had returned to its original (room) temp. The sign of the variation was dependent on the temp. to which the sample had been raised. Both with invar and platinite, as the temp. of the heating was increased, the resultant change of resistance changed sign at a point which appeared to correspond with the transformation point of the alloy. Successive re-heatings to the same temp. produced, in invar, slight changes, always in the same direction, but much smaller than that due to the first re-heating. The progressive changes of resistance which took place after a short interval subsequent to reheating were very gradual. H. G.

Three types of alloy sheet steel. HORACE C. KNERR. *Iron Age* 108, 594-6, 655-8(1921).—The report deals with an investigation of 3 com. types of high strength alloy steel in sheet form, in order to det. which was the most suitable for the manuf. of fittings for large air craft. Steel was required having a tensile strength of 150,000 lbs. per sq. in. combined with a suitable ductility to insure against brittleness. The steel should be capable of severe cold bending in any direction, independent of the direction of rolling, of successful welding by both acetylene and elec. spot methods and brazing, heat treatment being applied after these operations. Sheets were wanted in thickness from 0.035 up to 0.25 in. and about 18 in. wide by 6 ft. long. Three samples of the following compn. were rolled and a careful comparison was made of their characteristics:

| Kind of steel. | Ni. | Ni-Cr. | Cr-V. |
|----------------|--------------|--------------|----------------|
| C | 0.25 to 0.35 | 0.25 to 0.35 | 0.25 to 0.35 |
| Mn | 0.50 to 0.80 | 0.50 to 0.80 | 0.50 to 0.80 |
| P (max.) | 0.080 | 0.080 | 0.080 |
| S (max.) | 0.080 | 0.080 | 0.080 |
| Ni | 3.25 to 3.75 | 1.0 to 1.50 | |
| Cr | | 0.45 to 0.75 | 0.80 to 1.10 |
| V | | | 0.15 (minimum) |

Details are given as to manuf. and heat treatment necessary to attain highest tensile strength and hardness, together with other data. V. O. HOMERBERG

Influence of low temperatures on the magnetic properties of alloys of iron with nickel and manganese. K. ONNES, ROBERT A. HADFIELD AND H. R. WOLTER. *Proc. Roy. Soc. London* 99A, 174-96(1921).—A series of Fe-Mn and Fe-Ni alloys, with a range of percentages of Mn and Ni resp., were tested in order to investigate the influence of cooling to very low temps. (liquid H and liquid He) on their magnetic properties, especially to ascertain whether the Fe-Mn alloys, which are non-magnetic at atm. temp., become magnetic by so doing. With a view to the desirability of testing not only after, but also during immersion in liquid H, an app. was constructed which made it possible to test the samples quickly one after another at a temp. of 20° K, with as little loss of H as possible. The Fe-Mn alloys, contg. the higher percentages of Mn, cannot be made magnetic at atm. temp. by cooling to the b. p. of liquid H or liquid He. The existence of 1 magnetic and 1 non-magnetic, or at most slightly magnetic, Mn-Fe compd. was shown to be probable, and the non-magnetic properties of the higher Mn-Fe alloys may be explained by this means. V. O. HOMERBERG

The hardness of solid solutions. WALTER ROSENHAIN. *Proc. Roy. Soc. London* 99A, 198-202(1921); *Chem. Met. Eng.* 25, 243-5(1921).—An explanation is suggested for the hardening and stiffening effect of the added metal in solid-soln. alloys. This explanation is based upon the conception of the manner in which 2 metals may cryst. together in the form of the solid-soln. crystals. The arrangement of atoms of a metal

on a space-lattice and the spacing of the lattice are considered. R. concludes that the hardening effect of one metal upon another in the form of a solid soln. should, to a first approximation, be inversely proportional to its solid soly. V. O. HOMERBERG

Notched bar impact tests and toughness of Monel metal. R. G. WALTENBERG. *Chem. Met. Eng.* 25, 322-3(1921).—The Charpy and Izod tests are considered. W. found that the energy absorbed in fracturing Monel metal in impact was much greater than that required to fracture any other materials of which he had seen record of tests, including even heat-treated alloy steels. V. O. HOMERBERG

Casting manganese bronze test bars. E. H. DIX, JR. *Foundry* 49, 734-6(1921).—Several methods of casting test bars were tried and the results of the physical tests compared. Details are given of the method of melting and the compns. of the alloys.

V. O. HOMERBERG

The thermal expansion of aluminium-zinc alloys. ALFRED SCHULZE. Charlottenburg. *Physik. Z.* 22, 403-6(1921).—Measurements have been made at temps. between 20° and 400° of the thermal expansion of Zn, Al and of alloys of these metals contg. 12.5%, 25%, 37.5%, 50%, 62.5%, 75% and 87.5% Al. The value obtained for the coeff. of expansion of Al is slightly lower and that for Zn ($\alpha=36.4 \cdot 10^{-6}$) much higher than values previously detd. The curves obtained by plotting the expansions in mm. as ordinates against the temps. as abscissas, lie above and run parallel to the curve for pure Zn. Between 250° and 280°, the values obtained for alloys contg. up to 62.5% Al are smaller when detd. with rising temp. than when detd. with falling temp., thus indicating chem. transformation. The irregularities in the curves are attributed to the formation and decompn. of a compd. Al_2Zn_3 . Since, however, this compd. is only present in the region 1 to 70% Al, the measurements indicate that a hysteresis phenomenon is first manifested in the expansion in the alloy contg. 62.5% Al. H. J. C.

Pyrophoric alloys containing cerium. B. SIMMERSBACH. *Chem. Ztg.* 45, 577-9 (1921); cf. *C. A.* 14, 3197.—An historical review of the cerium-alloy industry.

F. P. FLAGG

Elektron-metal. E. WEINWURM. *Chem. Ztg.* 45, 579-80(1921); cf. *C. A.* 14, 3398.—Elektron-metal is an alloy containing 80% Mg and 20% of other metals, mostly Zn. It oxidizes easily in the air. It is dissolved by acid and salt solns. and by tap water. It is not attacked by solns. cf. the caustic alkalies. To protect it from atm. corrosion it can be painted with linseed oil varnish. Solns. of the cellulose esters dissolve it. The metal can be cast, forged, rolled and drawn. It machines easily. It can be welded with a suitable flux in an oxy-hydrogen flame burning a large excess of hydrogen. With proper care no damage from the combustion of chips of the metal need be feared. Elektron-metal is a good conductor of electricity. F. P. FLAGG

Foundry irons for particular uses. Y. A. DYER. *Iron Age* 108, 585-8(1921).—The differentiating characteristics of gray, mottled and chilled or white iron are discussed. The skill of manuf. is considered. The analyses for certain castings are given.

V. O. HOMERBERG

Satisfactory way to pour bearings and lead grout under bed plates. R. L. JOHNSON. *Elec. World* 78, 575(1921).—Recommends mixt. of asbestos and oil as sealing compd. in place of fireclay and water. Details are given. C. G. F.

Aluminium casting. F. A. LIVERMORE. *Brass World* 17, 231-3(1921).—The presence of 0.1-0.5% Mn facilitates casting without impairing the ductility and machining properties. For pouring the temp. should be $650^\circ \pm 10^\circ$. Old methods for detg. us.al impurities are outlined. W. H. BOYNTON

Brazing metal. R. R. CLARK. *Brass World* 17, 227(1921).—A Cu 86%, Zn 14% alloy is better for flanges and pipe to surface connections than the 50-50 alloy, as it forms more perfect union. To lessen shrinkage, susceptibility to depression under

hard rammed sand and mold gases, and the tendency to produce smoky castings the sand should be as dry as it consistently may be, the gates should be large, and the gate pressure high. The molds should be soft rammed, and the metal poured hot. To avoid smoky castings and reduce localized shrinkage the metal is cast, pigged and remelted for casting. The use of 60-40 brass with Cu eliminates the necessity of pigging and remelting. The particular part of a casting should be in the drag of the mold.

W. H. BOYNTON

The influence of foreign elements in ingot iron on its welding properties in flame welding. C. DIECEL. *Z. Ver. deut. Ing.* 65, 626-9 (1921).—Preliminary work carried out with rolled sheets of 3 different combinations showed that sheets having 0.27% Si were not suitable for flame welding while 0.25% Ni was not detrimental. Swedish wire of 0.005% S was very satisfactory but German wire containing 0.47% S was useless. The welds were tested by tension and bending tests and by a test carried out by bending 45° each side of center and repeating until failure. Tests were then carried out on 21 sheets of different compns. Besides the tests described above, these sheets were tested by bending double through an angle of 180°. Conclusions: (1) High C content is injurious; 0.3% C gives bad seams. (2) Si content should be kept as low as possible. (3) Mn is advantageous but not necessary in a minimum amt. as for hammer welding. Sufficient Mn to prevent brittleness is generally suitable for flame welding. More Mn seems to compensate somewhat for the bad effect of Si and S. Sheets with high Mn content are very malleable while hot and permit considerable hammering. (4) Variations in the P content have no noticeable effect. (5) S is by far the most detrimental element. Al is advantageous but it has practically no compensating influence with S. (6) A lower percent of Al and the presence of finely divided Al_2O_3 does not appear to be detrimental. Iron deoxidized with Al welds much better than undeoxydized iron. (7) Cr and Ni in small amts. have no noticeable effect. (8) Sheets best suited for flame welding have the following compn.: C 0.06-0.12, at most 0.15%; Si less than 0.02% if possible; with 0.5% Mn or more 0.15% Si is permissible. Flame welds were made with wires of 33 compns. with the following conclusions: (1) Wrought iron is not required for the manuf. of good welding wire, although the slag contained in it seems to be of some advantage. (2) The purer an iron is, the more suited it is for welding wires. It is very important to keep the S content as low as possible. (3) In general the presence of C, Si, Mn, Al, Ni and Cr in welding wire has the same effect as in the sheets. (4) Disregarding factors of unknown influence, very pure wrought iron from charcoal and electrolytic iron are best suited for welding. The analysis of this iron is C 0.03-0.06, Si 0.00-0.03, Mn 0.00-0.05, P 0.00-0.07, S 0.000-0.003%, max. S 0.005%. If iron of this kind is not available, the S content must be kept as low as possible and correspondingly high amts. of Mn added. In this way suitable ingot iron of the following analysis is obtained: C 0.03-0.10, Si 0.00-0.03, minimum Mn 0.35-0.40, P 0.01-0.05, max. S 0.005-0.010%; with minimum Mn 0.4-0.5%, max. S may be raised to 0.01-0.02%. In any case it is necessary to try out the actual welding with the materials to be used as it cannot be prophesied with certainty from the chem. analysis alone. Great care must be used in the selection of raw materials.

F. W. COBB

The economic situation of iron-ore mining in Latin America (CHARLTON) 8. Waste heat utilization for steam generation (McDERMOTT) 13. Utilization of steel-furnace slag for cement manufacture (JAP. pat. 37,153) 20.

Metallic chromium. MASAAKI YONEZU. Japan 36,882, Aug. 9, 1920. Ca chromate, heated to redness and cooled, is thoroughly mixed with untreated salt and Al powder and ignited. Metallic Cr free from C is produced.

Lead and silver from sulfide ores. H. HEY. U. S. 1,384,465, July 12. Sulfide ores of Pb and Ag are treated with HCl and the mixt. is dried and then heated to about 500-600° in order to effect a preferential chloridizing of the Pb and Ag present.

Amalgamating metals. R. H. STEVENS. U. S. 1,384,683, July 12. The pat. relates to mechanical features incident to the amalgamation and recovery of Au or similar materials while subjected to the action of an elec. current.

Tilting metallurgical furnace. B. TALBOT. U. S. 1,383,444, July 5.

Apparatus for removing dust suspended in gases from ore roasting. L. GESCHWIND. U. S. 1,383,715, July 5. Suspended screens of small chains are used to catch the dust.

Apparatus for heat-treating and oiling metal articles. W. H. NEEDHAM. U. S. 1,383,418, July 5. The app. is adapted for treating metal stampings or similar metal articles. It comprises a cleaning drum, a furnace, and drums or other devices for cooling, oiling and conveying away the articles successively in an automatic operation.

Fusible metal for electrical purposes. NIMAN NISHIMURA. Japan 36,896, Aug. 9, 1920. The fusible metal is made by melting together Cr, Ir, Ta, Mo, W or nichrome, etc. It is used in short strips for small current, e. g., 0.25 amp. or below.

Acid-resistant alloy. C. G. FINK. U. S. 1,384,056, July 12. An alloy resistant to acids and adapted for making or lining receptacles for acids is formed of Sn 10-30%, Ti 3-65%, Ba 1-3% (as a hardening agent) and the remainder of Pb. Sn 20, Ti 10 and Pb 70 parts may be used.

Molybdenum and tantalum alloy. J. B. GRENALE. U. S. 1,385,072, July 19. An alloy adapted for use as a Pt substitute for chemical and elec. app. is formed of Mo 60-90% and Ta 40-10%.

Aluminum-lead alloy. F. MILLIKEN. U. S. 1,385,223, July 19. An alloy which is dense and resists corrosion to a high degree is formed of Al 89-94 and Pb 5-10 parts, treated with a deoxidizing agent such as Mg 1-2% or a similar deoxidizing agent, which remains in the finished alloy after purification.

Treating porous castings. A. B. NORTON. U. S. 1,384,033, July 5. Porous castings of Al, Al alloy or other metals are treated with a hot soln. of NaOAc and NH₄Cl to form a ppt. within the pores of the metal and the treated castings are then heated to 100° to dry them thoroughly.

Treating porous castings. F. K. BEZZENBERGER and M. N. RICH. U. S. 1,383,517, July 5. Porous castings of Al alloys or other metals are filled with a pore-stopping of silica by successively treating with Na silicate soln., H₂SO₄ and washing and heating.

10—ORGANIC CHEMISTRY

CHARLES A. ROUILLER

The preparation of ethylene by hydrogenation of acetylene. WILLIAM H. ROSS, JAMES B. CULBERTSON AND J. P. PARSONS. *J. Ind. Eng. Chem.* 13, 775-8 (1921).—Mixts. of H₂ and C₂H₂ in varying amts. were passed through a glass tube about $\frac{1}{2}$ in. filled with Ni catalyst, which was prep'd. by reducing the oxide at 300°. The amt. of C₂H₄ in the recovered gases varied considerably with the proportion of H₂ and C₂H₂ in the mixt. With a slight excess of H₂ in the mixt. about 80% of C₂H₄ was obtained. A further increase of the H₂ caused a decrease in the C₂H₄ and a corresponding increase in the C₂H₆. As the amt. of C₂H₂ in the mixt. was increased the C₂H₆ decreased and the sum of the C₂H₄ and C₂H₂ increased. The Ni catalyst adsorbed both C₂H₂ and H₂, its. capacity for H₂ being greater than that of coconut charcoal. The adsorbed H₂ in an active Ni catalyst was eliminated without destroying the activity of the Ni by repeated treatment with C₂H₂. G. W. STRATTON

Catalytic reduction of ethylenic and acetylenic bonds. A. A. POLLITT. *Chem.*

Age (London) 5, 88-90(1921).—Unsatd. fatty acids, as well as unsatd. dibasic acids and ethylenic or acetylenic chains attached to aromatic nuclei, are reduced by H, with metals of the Pt group as catalysts. A current of H at the desired temp. is passed through the mixt. of the substance to be reduced with a quantity of the catalyst equiv. to 0.1 g. Pt or Pd for every 100 g. of substance. Sabatier's vapor method of reduction may be used for volatile compds. By catalytic reduction *δ-phenylvaleric acid* has been prepd. from cinnamylacrylic acid, *phenylpropylmalonic acid* from cinnamalmalonic acid, and *ω-phenylpropylcyanoacetic acid* from cinnamalcyanoacetic acid. All the ethylenic alcs. may be reduced to the corresponding satd. compds. or even to hydrocarbons, using colloidal Pt or Pd catalysts; thus *crotonyl alc.* gives BuOH, and *allyl alc.* gives PrOH. The higher sec. ethylenic alcs. give, on reduction with H and a Ni catalyst at 195-200°, the hydrocarbon and a satd. ketone (Douris, *C. A.* 7, 3311). Ipatiev (*C. A.* 8, 2158) reduced *anethole* in 4 hrs. at 95° under 50 atm. H pressure; longer reduction gave hexahydropropylbenzene. Reduction of *acrolein* with colloidal Pd gives the normal reduction product together with propionic aldehyde and allyl alc. Ipatiev reduced *methylethylacrolein* to Me iso-Bu ketone. *Mesityl oxide* reduced with Pd catalyst gives a mixt. of Me iso-Bu ketone and methylisobutylcarbinol (Skita, *C. A.* 9, 3249). Highly unsatd. ketones containing a double bond on each side of the CO are easily reduced to the corresponding satd. compds., but if either side of the CO group contains more than one double bond the yield is diminished (Borsche, *C. A.* 6, 870). *Phorone* on reduction gives (iso-Bu)₂CHOH; *isophorone* gives dihydroisophorone; *citral* gives decanol. *Ethylene* affords the simplest hydrocarbon reduction; for Ni catalyst the best temp. is 100-50°; for Cu 180-280°; Pt black causes reduction in the cold, but like Fe and Co is inactivated by C deposits. Unsatd. side chains attached to aromatic nuclei may be reduced with or without reduction of the aromatic nuclei; *styrene* and H over heated Cu give PhEt; over Ni, ethylhexahydrobenzene. CH:CH may be reduced by H to C₂H₄ with Pt black in the cold, with Ni at 90-5°, and with Cu, Fe, and Co attempts ranging from 120 to 200° (*Ber.* 7, 353(1874)). Colloidal Pd adsorbs CH:CH and must be satd. before use. The reduction may be modified by the choice of catalyst; *amylacetylene* and H give amylethylene with Cu at 180°, and heptane with Ni; Ph:CH gives PhEt with Cu and ethylcyclohexane with Ni. CH:CH substitution products may be reduced in stages; PhC:CH gives first styrene and then PhEt; *tolan* gives first isostilbene and then bibenzyl (*C. A.* 6, 2757). *Diallylenedicarboxylic acid*, containing 2 treble bonds, is reduced to suberic acid with Pt black. T. S. CARSWELL

A new method of preparing the sodium derivatives of acetylene hydrocarbons. PICON. *Compt. rend.* 173, 155-8(1921); *Bull. soc. chim.* 29, 709(1921); cf. *C. A.* 14, 1523-4.—The use of NaNH₂ for the production of Na derivs. of the C₂H₄ hydrocarbons is preferred to the use of Na, as with the former the possibility of reduction is eliminated. By the addition of the acetylenes to the NaNH₂ in liquid NH₃ theoretical yields of the mono-Na derivs. were obtained. For isooheptene and higher homologs boiling C₆H₆ may be used as a reaction medium. The mono-deriv., C₂HNa, heated *in vacuo* between 180° and 210° passed completely into C₂H₂ and C₂Na₂. The latter in contact with water released the theoretical quantity of C₂H₂. The C₂Na₂ decompd. into C and Na when heated above 290° even when all traces of water had absolutely been eliminated.

R. L. BROWN

Preparation of true acetylenes starting from 2,3-dibromopropylene. R. LESPIEUX. *Bull. soc. chim.* 29, 523-35(1921).—In running through the series of reactions CH₂:CBrCH₂Br (A) \xrightarrow{RMgX} CH₂:CBrCH₂R (B) yields of only $\frac{1}{3}$ of the theory were obtained, higher-boiling violet products being formed from which nothing definite could be isolated, but which appeared in 1 case at least to be formed by addition of the Mg

halide to the double bond. Instead of treating B with alc. KOH, a method which often involves shifting of the bonds, $\text{CH}_2\text{BrCBr}_2\text{CH}_3\text{R}$ (C) was prep'd., treated with 1 mol. NaOEt to form $\text{CHBr: CBrCH}_2\text{R}$, and this debrominated by heating with Zn powder and alc. The yields of C, however, are small, owing to the addition of the HBr formed to the B still present, and the method is, therefore, not a practical one. However, $\text{CHBr: CBrCH}_2\text{Br}$ (D) and RMgX give directly $\text{CH: CCH}_2\text{R}$, instead of the expected $\text{CHBr: CBrCH}_2\text{R}$. To prep. A, 200 g. $\text{CH}_2\text{BrCHBrCH}_2\text{Br}$ and 50-60 g. solid, com. NaOH or KOH are heated over a free flame until ebullition begins at the layer of alkali, further heating occurring only when the reaction moderates. The mixt. is finally distd. in a moderate vacuum, then redistd. on the H_2O bath under 20 mm., 105 g. A being obtained. Treated with Br, then with KOH under reduced pressure, it yields D, b_{10} 85°, d_{17} 2.431, n_D 1.603, is very irritating and causes intoxications if handled repeatedly. A and D react vigorously with RMgX (except that of C_2H_5), necessitating the use of much Et_2O , and addition of the bromide is stopped when it no longer causes evolution of heat. EtMgBr gave $\Delta^{1,2}\text{-2-bromoamylene}$, $\text{CH}_2: \text{CBrCH}_2\text{CH}_3\text{Me}$, b. 107-8°, d_{20} 1.228, n_D^{20} 1.4535, mol. wt. in HOAc 151. iso-PrBr gave $\Delta^{1,2}\text{-2-bromoisohexylene}$, $\text{CH}_2: \text{CBrCH}_2\text{CHMe}_2$, b. 126-7°, d_{17} 1.207, n_D^{18} 1.4627, mol. wt. in HOAc, 168. $\Delta^{1,2}\text{-2-Bromo-3-phenylpropylene}$, $\text{CH}_2: \text{CBrCH}_2\text{C}_6\text{H}_5$ (E), b_{10} 102°, m. -12.5°, d_6 1.39; $\Delta^{1,2}\text{-2-bromo-3-cyclohexylpropylene}$, $\text{CH}_2: \text{CBrCH}_2\text{C}_6\text{H}_{11}$, b_{10} 82°, d_{18} 1.24, n_D^{16} 1.501. With 2 atoms Br in CHCl_3 the following are formed: $1,2,2\text{-tribromopentane}$, b_{10} 108-9°, d_6 2.03; $1,2,2\text{-tribromoisohexane}$, $\text{CH}_2\text{BrCBr}_2\text{CH}_3\text{CHMe}_2$, b_{10} 116-7°, d_{17} 1.986, n_D^{17} 1.561; $1,2,2\text{-tribromo-3-phenylpropane}$, b_{10} 175-6°. With NaOEt these gave $\text{CBr: CBrCH}_2\text{CH}_3\text{Me}$, b_{10} 66-7°, b_{100} 169-70° (slight decompn.) (Bruylants gives 190°), mol. wt. in HOAc, 226, d_6 1.73; $\Delta^{1,2}\text{-1,2-dibromoisohexylene}$, $\text{CHBr: CBrCH}_2\text{CHMe}_2$, b_{10} 70-1°, d_7 1.621, n_D^{17} 1.512; the Ph compd. was not obtained pure. With Zn powder and 95% alc. at about 78° these give: 1-pentine; 4-methyl-1-pentine, $\text{CH: CCH}_2\text{CHMe}_2$ (F), b. 61.5-2°, d_6 0.7244, mol. wt. in HOAc, 82. With alc. AgNO_3 it gives white leaflets of $\text{C}_6\text{H}_5\text{Ag}\cdot\text{AgNO}_3$. In isolating F the fraction b. 54.5-5° represents a minimum-boiling mixt. of F and alc., which is allowed to stand several days over fused CaCl_2 and then redistd. Phenylpropine , $\text{CH: CCH}_2\text{C}_6\text{H}_5$, (G), from D and 3 mols. PhMgBr (yield, 40%), b_{20} 70-1°, b_{100} about 166° with polymerization, has an aromatic and acetylenic odor, gives a cryst. compound, $\text{C}_6\text{H}_5\text{Ag}\cdot\text{AgNO}_3$; the yellow Cu deriv., treated with I, gives $1,1,2\text{-triido-3-phenylpropylene}$, $\text{Cl}_3\text{CICH}_2\text{Ph}$, needles, m. 84-5°. Among the b_1 -products in the prepn. of G are Ph₂, PhOH, and crystals, m. 210°, which are not anthracene. E and 73% alc. KOH heated 3 hrs. in a "salt bath" gave MeC: CPh . Cyclohexylpropine , oil with strong odor, b. 157-60°, was obtained impure and only in small yield by both methods, gives leaflets with AgNO_3 . A by-product of the action of iso-PrMgBr on A, b_{10} 63°, is believed to be $2,3,5\text{-trimethyl-3-bromohexane}$, $\text{Me}_2\text{CHCBrMeCH}_2\text{CHMe}_2$, d_{17} 1.0942, n_D 1.456, mol. wt. in HOAc, 215, arising from the addition of iso-PrMgBr to $\text{CH}_2: \text{CBrCH}_2\text{CHMe}_2$, the main product of the reaction.

M. HEIDELBERGER

The application of a fractional distillation method in the preparation of sodium ethoxide from caustic soda. T. KENNEDY WALKER. Manchester Univ. *J. Soc. Chem. Ind.* **40**, 172-3T (1921).—EtOH, H_2O , and C_6H_6 form a const. boiling ternary mixt., and with a perfect stillhead any sample of moist EtOH could theoretically be dehydrated by distn. with C_6H_6 (Young, *J. Chem. Soc.* **81**, 707 (1902)). W. employed this method to remove the water from the system $\text{NaOH} + \text{EtOH} \rightleftharpoons \text{NaOEt} + \text{H}_2\text{O}$. The chief difficulty in the sepn. lies in the fact that the b. p. of the ternary mixt. is only a few degrees lower than that of the binary mixt. of EtOH and C_6H_6 or of the pure substances; complete conversion of the NaOH cannot be expected since the effective proportion of volatile matter toward the end of the process is small. The proportion of EtONa formed was detd. as follows: 10 cc. of liquid were titrated with 0.1 N HCl to

det. the total alkali ($\text{NaOH} + \text{EtONa}$). Another sample of 10 cc. was boiled with 12.5 cc. AcOEt and 50 cc. EtOH , when the following reaction took place: $x\text{NaOH} + y\text{EtOH} + z\text{H}_2\text{O} + w\text{EtONa} + u\text{AcOEt} = (x+z)\text{AcONa} + (w-z)\text{EtONa} + (u-x-z)\text{AcOEt} + (y+x+2z)\text{EtOH}$. The whole was then titrated with standard benzoic acid in EtOH . A diminution in alkalinity was thus observed as compared with the previous titration against 0.1 *N* alkali; this diminution in alkali gave $(x+z)$, the max. quantity of H_2O that would be obtained by evapg. 10 cc. of alk. fluid from the still to dryness without loss of water. The total alkali gives $(x+w)$, while $(w-z)$ was the minimum quantity of EtONa to be obtained by evapg. to dryness. The number $100(w-z)/(x+w)$ is the "mol. percentage yield" of EtONa . Blanks indicated that the method gave results 4% low. The C_6H_6 used was purified, dried, and redistd. Anhydrous EtOH was prep'd. from com. 96% alc. by dehydration with CaO and metallic Ca . The solns. before distn. were made up by mixing weighed quantities of EtOH , Na , and H_2O . Preliminary expts., in which the distn. was carried out through a Vigreux column 40 in. long and 0.75 in. in diam., gave a 25% yield, which by redistn. with fresh alc. and C_6H_6 was raised to 28.1%. By distn. through a Dufton stillhead (*C. A.* 13, 917) 1.5 m. long with an annular space 1.5 mm. wide, the yield was increased to 33.8%. About a 57% yield was obtained with a column 6 ft. high and 1.6 in. in diam., filled with 4000 Raschig rings of sheet iron; 40 g. NaOH (23 g. Na and 18 g. H_2O), 1012 g. alc., and 600 g. C_6H_6 were distd. at 1 drop per sec.; 149 g. distd. over up to 66.55° ; the distn. was stopped at 68.2° , leaving a flask residue of 785 cc. Analysis of this residue showed a 54.2% yield, while from the quantity of ternary mixt. obtained the value 61.2% was found.

T. S. CARSWELL

Preparation of some allyl compounds. SAMUEL COFFEY AND CHARLES FREDERICK WARD. Univ. College. *J. Chem. Soc.* 119, 1301-6 (1921).—500 g. $(\text{CO}_2\text{H})_2$ and 250 g. $\text{C}_3\text{H}_6(\text{OH})_3$, both well dried, are mixed in a l. flask and after exhausting to 120-100 mm., heated to about 60° when about 100 g. H_2O dists. (about 1 hr.). The pressure then rapidly rises to 480 mm. and the temp. remains at $105-10^\circ$, when CO_2 is evolved and HCO_2H and H_2O dist. over. After 1-1.5 hrs. the pressure falls to 120 mm., the temp. rises to 190° and the evolution of gas almost ceases. When the pressure again begins to increase, the distn. is carried on at atm. pressure, allyl alc. and formate distg. over together at 225° . At the close of the distn. the temp. increases to 240° and there is a rapid evolution of CO . The residue (80 g.) consists of $\text{C}_3\text{H}_6(\text{OH})_3$. The mixt. of alc. and ester, boiled 1 hr. with 10% NaOH , should give 100 g. pure allyl alc. If washed with water, dried and distd., pure allyl formate is obtained. If the HCO_2H from the 1st distillate is recovered, the yields should be 40 g. HCO_2H and 100 g. $\text{CH}_2:\text{CHCH}_2\text{O}_2\text{CH}$ or about 100 g. $\text{CH}_2:\text{CHCH}_2\text{OH}$. A number of expts. show that the yield of alc. calcd. on the $\text{C}_3\text{H}_6(\text{OH})_3$ actually used is always nearly quant. As the amt. of $(\text{CO}_2\text{H})_2$ increases the yield of formate in comparison with alc. also increases, and the amt. of free HCO_2H increases, while the amt. lost as CO is diminished. $\text{CH}_2:\text{CHCH}_2\text{Cl}$ is best prep'd. from 46 g. alc. and 20 g. ZnCl_2 by passing HCl gas into the mixt. 35 g. chloride (60%) and 10 g. diallyl ether are obtained in 0.5 hr. AlCl_3 gives very little chloride and a large tar-like residue. CaCl_2 and the alc. form an additive mixt., which, heated at $80-90^\circ$ in a stream of HCl , gives a product (diallyl ether?), b. $90-2^\circ$. C. J. WEST

Preparation of chloro- and bromotrinitromethane. ERICH SCHMIDT, RICHARD SCHUMACHER AND HANS KUHLMANN. Univ. Berlin. *Ber.* 54B, 1483-4 (1921).—*Chlorotrinitromethane*, b.p. 32° , n_D 4.5° , liberates I from KI , is obtained in 47.4-g. yield from 35 g. dry sifted K nitroform suspended in 200 cc. Et_2O in ice treated with dry Cl until converted into white KCl (about 1 hr.), treated with H_2O to dissolve the KCl and dried with Na_2SO_4 . $\text{BrC}(\text{NO}_2)_3$, similarly obtained in 62.8 g. yield from 55 g. K nitroform, 200 cc. Et_2O and 46 g. Br_2 , b.p. $55-6^\circ$, solidifies $17-8^\circ$. The K nitroform is obtained

in 55.5 g. yield from 60 g. $\text{C}(\text{NO}_2)_4$ in 180 cc. alc. in ice, slowly treated with 15 g. K in 100 cc. alc. and allowed to stand 1 hr.

CHAS. A. ROUILLER

Tetranitromethane. IV. Conversion of tertiary amines into secondary nitrosamines. II. ERICH SCHMIDT AND RICHARD SCHUMACHER. Univ. Berlin. *Ber.* **54**BS, 1414-19(1921); cf. *C. A.* **15**, 86.—The method of converting tertiary aliphatic-aromatic amines by means of $\text{C}(\text{NO}_2)_4$ (A) in the presence of $\text{C}_6\text{H}_4\text{N}$ into sec. nitrosamines has been successfully applied to some nucleus-substituted halogenamines. The conversion of tertiary aliphatic bases into the sec. amines, on the other hand, is advantageously effected in AcOH . Thus, *N*-methyl-*m*-bromophenylnitrosamine (yield, 4.8 g. of crude product), m. 43-4°, is obtained by dropping 5.4 g. A into 5 g. *m*-Br $\text{C}_6\text{H}_4\text{NMe}_2$ and 2.7 g. $\text{C}_6\text{H}_4\text{N}$ in 25 cc. alc., boiling 1 hr., distg. off the Et_2O and boiling a short time in 54 cc. gasoline with charcoal. The *m*-Br $\text{C}_6\text{H}_4\text{NMe}_2$, b₂ 100-4°, m. 11°, is obtained in 10.1 g. yield by Reinhardt and Staedel's method (*Ber.* **16**, 29(1883)) from 20 g. $\text{Br-C}_6\text{H}_4\text{NH}_2\text{HBr}$ heated 10 hrs. at 150° with 6.5 g. MeOH , the di-Me compd. being obtained from the mixt. of bases purified by steam distn. by means of Ac_2O (Wieland, *C. A.* **4**, 1488). *p*-Br isomer (10 g. from 10.8 g. A, 10 g. *p*-Br $\text{C}_6\text{H}_4\text{NMe}_2$ and 5.5 g. $\text{C}_6\text{H}_4\text{N}$ in 60 cc. alc. boiled 2 hrs.), needles, m. 73-4°, from C_6H_6 -petr. ether (1:3). 2,4-Cl₂ $\text{C}_6\text{H}_3\text{N}(\text{NO})\text{Me}$ (8 g. from 9.1 g. A, 8 g. Cl₂ $\text{C}_6\text{H}_3\text{NMe}_2$ and 4.9 g. $\text{C}_6\text{H}_4\text{N}$ boiled 2 hrs.), needles, m. 53-4°. The Cl₂ $\text{C}_6\text{H}_3\text{NMe}_2$, b₂ 92-5°, is obtained in 11.7-g. yield by heating 20 g. 2,4-Cl₂ $\text{C}_6\text{H}_3\text{NH}_2\text{HBr}$ and 6.5 g. MeOH 10 hrs. at 150° and treating the mixt. of bases, purified by steam distn., with Ac_2O . The 3 following nitrosamines were prep'd. by heating the reagents 3 hrs. at 100° in sealed tubes, shaking vigorously with 20 cc. of 33% KOH and 100 cc. H_2O , adding 100 cc. satd. NaCl , extg. twice with Et_2O , washing with H_2O , shaking with acidified H_2O (10 cc. dil. H_2SO_4 in 50 cc. H_2O), again washing with H_2O and drying with Na_2SO_4 . Pr_2NNO (6 g. from 7.2 g. Pr_2N , 6.1 g. AcOH and 10.8 g. A in 50 cc. alc.), b_{1,4} 59-61°. (iso-Bu)₂NNO (7.3 g. from 9.3 g. (iso-Bu)₂N, 6.1 g. AcOH and 10.8 g. A in 60 cc. alc.), b_{1,4} 68°. (iso-Am)₂NNO (7.5 g. from 10 g. (iso-Am)₂N, 5.4 g. AcOH and 9.5 g. A in 50 cc. alc.), b_{2,5} 100-2°. When 5.1 g. Et_2N and 12 g. AcOH in 35 cc. alc. are heated 4 hrs. at 100° with 12.7 g. A, then treated with 100 cc. satd. NaCl and 15 g. KHCO_3 and extd. with Et_2O when the evolution of CO_2 ceases, and the ext. is shaken 10 min. with 5 g. KHCO_3 , dried with Na_2SO_4 and distd. and the 4.8 g. b₁₂ 58-90° is shaken 5 min. with 5 cc. of 33% KOH and 25 cc. H_2O , treated with 50 cc. satd. NaCl and extd. with Et_2O there is obtained 3.2 g. Et_2NNO , b₁₂ 61-3°. *m*-O₂- $\text{C}_6\text{H}_4\text{NMeNO}$, m. 74-5° after crystn. from alc., is also obtained in 5.2-g. yield from 5 g. O₂NC₆H₄NMe₂ and 3.6 g. AcOH in 35 cc. alc. heated 3 hrs. at 100° with 6.5 g. A in 5 cc. alc.

CHAS. A. ROUILLER

Accelerated formation of magnesium alkyl and aryl halides. HARRY HEPWORTH. Research Lab., Stevenston, N. B. *J. Chem. Soc.* **119**, 1249-56(1921).—H. reports that alkyl sulfides accelerate the formation of MeMgI but not to such an extent as Et_2O . Double compds. containing the sulfides and MeMgI are formed, but are not cryst. The reaction is much slower with PhI . SeEt_2 and TeMe_2 accelerate the formation of MeMgI to about the same extent as Et_2S . The sulfoxides are also capable of accelerating the reaction; the double compds. appear to have the formula $2\text{R}_2\text{SO} \cdot \text{MeMgI}$, but they have not been obtained cryst. The catalyzing action is rather more pronounced than that of the sulfides. The sulfones have no effect. In a further series of expts. it was found that open chain compds. (EtOPr and EtSPr) react more readily than the corresponding closed-chain oxide and sulfide, from which it is evident that ring formation diminishes the catalytic activity of these compds. 1,4-Dithian and 1,4-dioxan are more active than $(\text{CH}_2)_6\text{S}$ and $(\text{CH}_2)_6\text{O}$; the dithian is almost as active as the dioxan but both are much less active than EtOPr and EtSPr . 1,4-Thioxan is more active than 1,4-dithian, its activity being almost equal to that of 1,4-dioxan. This emphasizes

the fact that O compds. are more active than S compds. No difference in reactivity could be detected between 1,3- and 1,4-dioxan. This indicates that the catalytic activity is not due solely to the unsatd. nature of the O atoms in these compds. All these indicate also that Et₂O is unique in its catalytic action and that S, Se and Te compds., which show an increasing tendency to become quadrivalent, do not catalyze the formation of MgRX to such an extent as the corresponding O compds. C. J. WEST

Action of monomolecular formaldehyde on Grignard compounds (with reference to the work of K. Ziegler under the same title). ERICH KRAUSE. Techn. Hochschule Berlin. *Ber.* **54B**, 1466(1921).—Z. (*C. A.* **15**, 3090) has evidently overlooked the paper of Grützner and K. (*C. A.* **11**, 2677) on the use of gaseous HCHO in the Grignard reaction.

CHAS. A. ROUILLER

Hexamethylenetetramine. I. FRIEDRICH L. HAHN AND H. WALTER. Univ. Frankfurt a. M. *Ber.* **54B**, 1531-42(1921).—In spite of numerous investigations, no satisfactory constitutional formula for hexamethylenetetramine (A) has yet been established. For a further study of this problem the quaternary salts of A seemed to be specially well adapted, as in them at least one of the 4 N atoms is different from the others. It has been found that A adds not only with alkyl halides, Me₂SO₄, MeONO₂ and MeSCN, as reported in the literature, but also with esters of various aliphatic alcs. and PhCH₃OH and esters of various acids, especially aromatic sulfonic acids, and these addition products, like those with alkyl halides, can easily be decompd. into primary amines and alcs. or ketones (Delépine, *Compt. rend.* **124**, 292(1897); Mannich and Hahn, *C. A.* **5**, 3237) and as these esters can now be readily made from the alcs. and PhSO₃Cl (Földi, *C. A.* **15**, 856) this may perhaps often prove to be a useful means of converting the grouping =CHOH into =CHNH₂ or =C:O. A also reacts with remarkable ease with the Me (and Et) ethers of picric acid, the resulting addition products being identical with those obtained when a Me or Et ester addition product is treated with picric acid, showing that the base of all the Me (or Et) compds. is the same. HClO₄ is also well adapted to characterizing the 2 series of compds. The A (1 g.) in 10 cc. CHCl₃ was treated with the second component (also in a little CHCl₃ if necessary) and the pptd. salt washed with CHCl₃ and Et₂O. All are easily sol. in H₂O, easily in hot, generally with difficulty in cold alc., difficultly or not at all sol. in other solvents. The following compds. were prep'd.: *Methylhexamethylenetetramonium methyl sulfate* (B), (C₆H₁₂N₄Me)SO₄Me, from 15 g. A in cold soln. slowly treated with 10 g. Me₂SO₄ and allowed to stand 10-2 hrs., m. 158°, gives a ppt. with BaCl₂ only on heating or long standing. *Ammonium sulfate* (C), (C₆H₁₂N₄Me)SO₄NH₄, m. 214-5°, may be prep'd. in 3 ways: (1) 13.3 g. B intimately rubbed with 7 g. A is boiled 3-4 hrs. under a reflux with 20 cc. H₂O, evapd. to dryness, digested with hot alc., filtered and washed with Et₂O; (2) 13.3 g. B is heated 1 hr. on the H₂O bath with 15 cc. concd. NH₄OH, concd. and ptd. with MeOH; yield, 13 g.; (3) 115 cc. of 40% HCHO, 40 cc. of 25% NH₄OH and 27 g. (NH₄)₂SO₄ are boiled 3-4 hrs. under a reflux, concd. until a cryst. crust begins to form on the surface, cooled and ptd. with MeOH; yield, 50 g. *Bis(methylhexamethylenetetramonium) sulfate*, from 51.8 g. C and 31.8 g. freshly crystd. Ba(OH)₂ intimately rubbed together, allowed to stand *in vacuo* over H₂SO₄ until the evolution of NH₃ ceases, then dried in the vacuum pan and extd. in a Soxhlet with alc., very hygroscopic crystals from alc., m. 212°. *Ethylhexamethylenetetramonium ethyl sulfate*, from 15 g. A in 150 cc. CHCl₃ and 15 cc. Et₂SO₄ allowed to stand 20 hrs., m. 114-5°. *Methylhexamethylenetetramonium nitrate*, from 19.2 g. A and 10 g. MeNO₃, long needles from alc., m. 201-2° (decompn.). *Ethyl homolog*, from 14 g. A and 9.1 g. EtNO₃ after 8-10 days, crystals from MeOH, m. 137°, decompd. on long standing. *Methylhexamethylenetetramonium picrate* (D), orange-yellow crystals, m. 204°, may be obtained: (1) from any other salt in a little H₂O or aq. alc. treated with excess of alc. picric acid; (2) from equimol. aqts.

of $(O_2N)_2C_6H_2OMe$ and A allowed to stand 2 days in $CHCl_3$; (3) from 14 g. A in 30 cc. H_2O and 23 g. picric acid in 120 cc. H_2O boiled 2-3 hrs. under a reflux with 23 cc. of 40% $HCHO$. *Chloride*, from 113 cc. of 40% $HCHO$, 40 cc. of 25% NH_4OH and 22 g. NH_4Cl boiled 7-8 hrs. under a reflux, m. 186°. *Ethylhexamethylene tetrammonium picrate*, prepd. like the Me compd., S-yellow crystals from aq. alc., m. 173-3.5°. *Methylhexamethylene tetrammonium perchlorate*, pearly scales from alc., m. 204°, deflagrates faintly when rapidly heated above 300°. *Ethyl homolog*, m. 141-2°. Me_2BO_3 , $BzOMe$, α - $HOCH_2CO_2Me$, σ -, m - and p - $ClC_6H_4CO_2Me$, m - $O_2NC_6H_4CO_2Me$, $(O_2N)_2C_6H_2CO_2Me$ and HCO_2Me form no ppt. with A in $CHCl_3$ even after months. Equimol. amts. of $ClCH_2CO_2Me$ and A after 2 days quant. yield a compound $C_9H_{17}O_4N_2Cl$, m. 143°, whose Cl is ionizable and which on attempted crystn. from alc. gives $HCl \cdot H_2NCH_2CO_2Me$. *Ethyl homolog*, from $ClCH_2CO_2Et$, m. 198°. The compound $C_9H_{17}O_4N_2Br$, from $BrCH_2CO_2Me$ after 45 min., m. 130°. *Ethyl homolog*, obtained quant. in 2-3 min., m. 172°. The compound $C_9H_{17}O_4N_2I$, quant. obtained in 0.5 min. from ICH_2CO_2Me , m. 142°, sensitive to light but indefinitely stable in the dark. *Ethyl homolog*, obtained in a few sec., m. 169°. Cl_2CHCO_2Me gives no ppt. with A in $CHCl_3$ in 2-3 months. From 9 g. Cl_2CCO_2Me and 7 g. A in 85 cc. $CHCl_3$ allowed to stand overnight is obtained 15 g. of a compound $(C_{10}H_{17}O_4N_2Cl_2)Cl$, tables, m. 142°, yielding a S-yellow *picrate*, m. 167°, which depresses the m. p. of D to 115°. All the above compds. therefore, have the structure $(C_6H_{12}N_2CH_2CO_2R)X$, not $(C_6H_{12}N_2R)O_4CCH_2X$. *Methylhexamethylene tetrammonium thiocyanate*, obtained quant. after 3-4 hrs., gives a dark red color in H_2O with $FeCl_3$. *Benzylhexamethylene tetrammonium thiocyanate*, obtained quant. after 12-4 days, silky fibrous crystals from alc., m. 172°. *Methylhexamethylene tetrammonium p-toluenesulfonate*, from 14 g. A and 18.6 g. p - $MeC_6H_4SO_3Me$ after 6-8 hrs., m. 204-5°. β -*Naphthalenesulfonate*, obtained quant. after 10 hrs., m. 213-4°. *Ethylhexamethylene tetrammonium benzenesulfonate*, obtained after 3-4 days, m. 157°, evolves the odor of AcH when boiled with aq. alc. *Propyl benzenesulfonate*, from 6 g. $PrOH$ and 17.6 g. $PhSO_3Cl$ in 100 cc. Et_2O in a freezing mixt. treated in small portions with 15 g. freshly powdered KOH below 3-4°, allowed to stand until a filtered portion no longer colors a Cu wire in the flame green, shaken with enough H_2O to dissolve the sediment, sepd. from the aq. layer, washed with H_2O and dried with Na_2SO_4 , faintly yellowish, almost odorless oil, begins to decomp. 100°; 10 g. allowed to stand 14 days with 7 g. A gives *propylhexamethylene tetrammonium benzenesulfonate*, m. 134°. *Isopropyl isomer*, m. 131°. *Propyl p-toluenesulfonate*, b. 138° in a cathode light vacuum, decomp. above 150°, reacts so slowly with A that even after 6 weeks not enough ppt. was obtained for investigation. *Benzyl benzenesulfonate*, m. 59°, decomp. on standing in a desiccator 2-3 days. *Benzylhexamethylene tetrammonium benzenesulfonate*, m. 169°. *Allyl analog*, m. 130°; 34 g. in 150 cc. H_2O and 10 cc. of 2 N soda distd. in CO_2 yields 3 g. acrolein, while 20 g. allowed to stand with occasional shaking under 30 cc. concd. HCl and 240 cc. alc. gives 3.4 g. allylamine- HCl .

CHAS. A. ROUILLER

Velocity of hydrolysis of ethyl orthoformate. ANTON SKRABAL AND OTTO RINGER. Univ. Graz. *Monatsch.* **42**, 9-46 (1921).—The hydrolysis of $HC(OEt)_3$ proceeds in 2 steps, the intermediate product being HCO_2Et . In acid soln. this 1st reaction is very rapid; the velocity is proportional to the concn. of the ester and the H ion. The value of k is 70000 (25°). The value for k in the hydrolysis of HCO_2Et is 0.192 (25°). The measurement of the rapid reaction is carried out by the use of a mixt. of primary and sec. phosphates. Under the conditions the 2nd step in the hydrolysis is very slow. The remainder of the article is a theoretical discussion of the hydrolysis of compds. of the type: ROR' , AOR , and AOA' , and the relation of $(EtO)_2CH$ to the ether type.

C. J. WEST

The precipitation of solid fatty acids with lead acetate in alcoholic solution. E.

Twirtschaft. *J. Ind. Eng. Chem.* **13**, 806-7 (1921).—To the fatty acid mixt., containing 1 to 1.5 g. of solid acids in boiling 95% EtOH, 1.5 g. of $(\text{AcO})_2\text{Pb}$ in boiling 95% EtOH is added. The total EtOH in the two solns. should be about 100 cc. After standing at about 15° for several hrs. the soln. is filtered, the ppt. washed with 95% EtOH and dissolved in 100 cc. of 95% EtOH to which 0.5 g. of AcOH has been added. The Pb salts which sep. on cooling after filtration and washing are decompd. with dil. HNO_3 , and the fatty acids extd. with Et_2O . By this method the I value of the solid fatty acids is usually under 1%. In the analyses of beef tallow the I value of the solid fatty acids could not be reduced below 3.89. This would indicate the presence of a small amt. of an unsatd. solid fatty acid.

G. W. STRATTON

Linolenic and hexabromostearic acids and some of their derivatives. SAMUEL COFFEY. Univ. College. *J. Chem. Soc.* **119**, 1306-10 (1921).—Expts. on the fractional crystn. of the Zn salts of the liquid fatty acids of linseed oil from alc. did not confirm the results of Erdmann (*C. A.* **6**, 862) that a pure α -linolenic acid could be obtained in this way. Since this salt is the most sol. component, it would appear impossible to accomplish its purification by fractional crystn. The following alkaloidal salts of hexabromostearic acid were prep'd. *Quinine*, in C_6H_5 soln., $\text{C}_{18}\text{H}_{30}\text{O}_2\text{Br}_6\text{C}_{20}\text{H}_{24}\text{O}_2\text{N}_2$, ill-defined cryst. compd., m. 169° (decompn.), which varies with the rate of heating. *Strychnine*, prep'd. in a mixt. of 90% C_6H_5 and 10% abs. alc., $\text{C}_{18}\text{H}_{30}\text{O}_2\text{Br}_6\text{C}_{20}\text{H}_{22}\text{O}_2\text{N}_2$, flat, micro-rhombs, m. $224-6^\circ$ (decompn.). The acid obtained after 7 crystns. of the salt m. 185° (original acid, m. 185°). *Morphine*, aggregates of microrhombs, m. $181-2^\circ$; the acid from this salt also m. 185° . *Narcotine*, m. 184° . These expts. show that in all probability hexabromostearic acid is a homogeneous product.

C. J. WEST

The catalytic oxidation of some alcohols under the influence of photoactive ketones and the explanation of the phenomena of catalysis. J. BÖSEKSEN. Delft. *Rec. trav. chim.* **40**, 433-45 (1921).—Some years ago B. showed in a paper on catalysis (*C. A.* **8**, 3520) that the most important part of a catalytic action is not to be sought in the formation of a combination of catalyst and the substance to be activated, but in the phenomena which take place before (and during) this combination, phenomena which may be described as a change in the trajectories of the electrons upon the approach of the catalyst. B. then expressed the view that the study of photocatalysis would be profitable in this connection. Work done with Cohen (*C. A.* **14**, 2785) and Müller (to be published) has given the results desired. Besides having found the entire course of a photochem. reaction these results have shown that catalysis is accompanied by a change in the absorption spectrum. It was found in some cases that the substance catalytically active has a different color than the catalyst and the nonactivated compd. taken alone. This change of color is the change in the trajectory of the electrons sought. The results of Cohen (*l. c.*) showed: (1) that aromatic ketones absorb violet rays and that many become photoactive and then activate alc.; (2) in the absence of O_2 the corresponding pinacol and aldehyde or ketone are formed. In the presence of O_2 the alc. are oxidized as before but the ketone is continually regenerated. (3) The formation of the pinacol shows a temp. coeff. of 1.1 for 10° , and the velocity of its formation is independent of the concn. of the ketone but proportional to the concn. of the alc. The reaction is trimol. thus: 2 ketone + alc. \longrightarrow pinacol + aldehyde (ketone). The alc. and ketone give rise to a complex (as indicated by color changes in some cases), a "photosubstance," and this under the action of intense light is transformed as stated in (2). Exptl. results are given which show that (1) light + 2 ketone + alc. \longrightarrow pinacol + aldehyde, and (2) light + ketone + alc. + O_2 \longrightarrow ketone + aldehyde + H_2O , takes place in such a way that the number of alc. mols. transformed in both (1) and (2) is the same and when both reactions are measured the same thing is measured in both cases. The results show that the ratio of mols. of pinacol formed to those of O absorbed is as 2:1. The illumination of

a mixt. of ketone and alc. gives rise to a series of phenomena: (1) violet light is absorbed by which the ketone is activated which may be represented thus: $[ketone'] = I_0(1 - e^{-\alpha \cdot c \cdot d})K$, where $[ketone']$ is the activated ketone, I_0 the quantity of light which penetrates, K a factor which depends on the nature of the ketone, the form of the vessel, etc., α the coeff. of absorption, c the concn. of the ketone, d the thickness of the layer. (2) The activated ketone complex is formed thus: 2 ketone' + alc. \longrightarrow (ketone')₂ alc. (3) The activated ketone complex then at once gives rise to the activated alc. complex by induction $((ketone')_2 alc')$ so that the 2 H atoms become mobile. (4) If O₂ is excluded this decompns. thus: (ketone')₂ alc' \longrightarrow pinacol + aldehyde. If O₂ is present the reaction is 2(ketone')₂ alc' + O₂ \longrightarrow 4 ketone + 2 aldehyde + 2H₂O. If it is admitted that it is the formation of the ternary complex of the activated ketone that is measured the mol. ratio of pinacol formed to O consumed should be 2:1 as was found. This was proved in 3 ways. (1) In accordance with equations not given above the velocity of the reaction should be proportional to the square of the intensity of illumination which was found to be true by expts. described. (2) If there is really a ternary complex formed such as the above, evidence of its formation should be given by the fusion curve of ketone-alc. systems. Two such curves are given in which this complex is formed in the fused mixt. (3) If the formation of the ternary complex in (2) and the activated complex requires time it is necessary that in cases where the formation of the activated complex is observed by a color this development of color should require time. This was also shown to be true by expts. described. *Experimental confirmation of the theory of dislocation of the catalysis and the explanation of this phenomenon.* What light does the above explanation of the photochem. reaction throw upon catalytic phenomena in general? In absorbing light the ketone mols. take on a form richer in energy and this activated ketone or *superketone* is the true catalyst. The action of the light consists in transforming one substance into another, and when the light stops the whole process stops. The quantity of light dets. the quantity of catalyst, $KI(1 - e^{-\alpha \cdot c \cdot d})$, and it is as if the light had introduced into the liquid a piece of catalyst of this wt. of which the d. diminished gradually from the illuminated surface toward the interior of the liquid. Depending on the values of c this photocatalysis may resemble heterogeneous or homogeneous catalysis. In the above cases the formation of the ternary complex ((ketone); alc.) was demonstrated but some ketones are not active that form such complexes and B. has shown that this complex formation does not intervene in the catalysis properly called. Their importance should not, however, be underestimated because they greatly facilitate the induction action. B. expresses the reactions described above as well as the similar reaction catalyzed by Pt in the electronic reaction symbols of Baur (*C. A.* 13, 282), by which it is shown that an ordinary catalyst is capable of exercising the induction action without dependence on external luminous energy. These ordinary catalysts are dependent upon the temp., while photocatalyses which are provoked by vibrations of high frequency (corresponding to temps. of thousands of degrees) are not much influenced by a change of 10°. B. concludes by saying that these expts. have given the first decisive proof of the theory of dislocation and in that way a satisfactory explanation of the basis of all catalytic phenomena. E. J. WITZEMANN

Aminoacylcholine esters. I. Glycylcholine. HAROLD WARD DUDLEY. Nat. Inst. Med. Research, Hampstead. *J. Chem. Soc.* 119, 1256-60 (1921).—Cryst. choline, the prepns. of which has been disputed, is readily obtained by shaking an aq. soln. of the chloride with Ag₂O, concg. the filtrate *in vacuo* to a viscous sirup, dissolving in alc., and again concg. *in vacuo*, extg. with Et₂O and allowing to stand in a desiccator over P₂O₅. *Glycylcholine chloroplatinate*, Me₂NCl.C₂H₅O.COCH₂NH₂HCl.PtCl₄.H₂O, is prepnd. by heating an intimate mixt. of dry choline chloride and CICOCH₂NH₂HCl *in vacuo* at 100° for 6 hrs. The residue, after digesting with alc., is dissolved in 50% alc. and treated

with 5% aq. H_2PtCl_6 . The chloride forms clusters of orange needles which m. 236–8°. *Glycylcholine chloride hydrochloride*, obtained by pptg. the Pt with H_2S , is a hygroscopic cryst. substance, very sol. in H_2O , from which it seps. in prismatic needles. The *chloroaurate*, $Me_3NCl \cdot C_2H_5O \cdot COCH_2NH_2 \cdot HCl \cdot 2AuCl_4$, from a soln. of the HCl salt in H_2O and $AuCl_4$, forms glistening golden platelets from H_2O , m. 180–4°. It slowly decompns. when heated to 110–20°. The *double salt* of the HCl salt with *mercuric chloride* crysts. in fine, woolly needles, m. 150–6°.

C. J. WEST

Action of alkalies on glyoxal. B. HOMOLKA. Farbwercke, Höchst a. M. *Ber.* 54B, 1393–6 (1921).—Whereas with caustic alkalies (CHO_2^-) behaves like other aldehydes, one CHO group being oxidized, the other reduced, with formation of $HOCH_2CO_2H$, the reaction with alkali carbonates is quite different. Thus, when 1 kg. of $(CHO_2NaHSO_4)_2$ is added to 15 l. soda soln. (satd. in the cold) at 50° the soln. quickly becomes yellow and begins to deposit the blue-black crystals with green metallic luster of Nietzki and Benckiser's di-Na tetrahydroxyquinone (*Ber.* 18, 1837 (1885)), identified by analysis of the Ba salt and by the fact that by N. and B.'s methods it yields the whole series of the so-called "potassium-carbon monoxide compds." (dihydroxydiquinoyl or rhodizonic acid, triquinoyl or hydroxycarboxylic acid, hexaacetoxybenzene, croconic acid). These compds. are also formed, together with a very large amt. of $HOCH_2CO_2H$, from $(CHO_2NaHSO_4)_2$ treated as above with NaOH. If 30% aq. $(CHO_2)_2$ is treated with 2 mols. Na_2SO_3 reaction at once takes place; the liquid becomes almost boiling hot and absorbs O from the air, turning deep yellow, then black-violet, and soon deposits the violet crystals of di-Na rhodizonate. Similarly, the Na salt of dihydroxytartaric acid brought to a boil with 4–5 parts Na_2SO_3 in H_2O yields Na rhodizonate. CHAS. A. ROUILLER

Acyclic δ -diketones. E.-E. BLAISE. *Compt. rend.* 173, 313–5 (1921).—Condensation of $EtMgBr$ with $CH_2(CH_2CN)_2$ results in the evolution of gas and the formation of only very small amts. of 2 products remaining in the Et_2O after decompn. with H_2O and dil. H_2SO_4 : the δ -diketone *di-propionylpropane* (A), $CH_2(CH_2COEt)_2$, b₁₀ 124–5°, plates m. 58°, and N-containing needles also giving a semicarbazone. The aq. soln., treated with NH_4OH and shaken out with *iso*-BuOH, yields a red resin which is converted by concd. HCl on the H_2O bath into basic products, of which one b_{10.4} 120–5° and forms needles m. about 57°. However, when $CH_2(CH_2CONEt_2)_2$ is used with $EtMgBr$ 25–30% of the theory of A is formed; *disemicarbazone*, m. 195–6°. Warmed 15 min. on the H_2O bath with 1:1 HCl, A loses H_2O and forms *methylethylcyclohexenone*, $(CH_2)_2CEt \cdot CMe \cdot CO$, liquid with a pronounced odor, b₁₀ 105°; *semicarbazone*, needles,

m. 250°. 5% aq. KOH, aq. NH_3 , and 15% $(CO_2H)_2$ also cause the same change.

M. HEIDELBERGER

Transformation of malonic acid into glycollic and of methylmalonic acid into α -alanine. THEODOR CURTIUS AND WILHELM SIEBER. Univ. Heidelberg. *Ber.* 54B, 1430–7 (1921).—*Potassium malonhydrazinate* (A), $KO_2CCH_2CONHNH_2$ (90 g. from 100 g. $KO_2CCH_2CO_2Et$ quickly dissolved on the H_2O bath in 40 g. $N_2H_4 \cdot H_2O$, allowed to cryst. over H_2SO_4 , rubbed up with abs. alc. and washed with Et_2O , deliquesces in the air, has a faint alk. reaction, m. 174°; 3 g. in H_2O acidified with HCl and shaken with 2 g. BzH gives 3.5 g. *benzalmalonhydrazinic acid*, $HO_2CCH_2CONHN \cdot CHPh$, slender needles from H_2O , m. 162° (gas evolution), forms an acid aq. soln. *Potassium methylmalonhydrazinate* (20 g. from 20 g. $KO_2CCHMeCO_2Et$ and 10 g. $N_2H_4 \cdot H_2O$), cryst. powder, m. 120–2°. *Benzalmethylmalonhydrazinic acid*, slender needles from H_2O , m. 148°, forms an acid aq. soln. When 5 g. A and 2.2 g. $NaNO_2$ in 25 cc. ice H_2O under a layer of Et_2O are slowly treated with 12 cc. of 18.5% HCl, there is a faint evolution of gas and the odor of HN_3 develops; the soln. is extd. twice more with Et_2O and the exts. are washed with very little cold H_2O , dried with Na_2SO_4 and evapd., leaving an oil

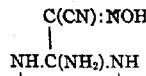
miscible with alc., Et_2O and H_2O which with AgNO_3 gives a very faint turbidity of AgN_3 increasing only on gentle warming. The oil, however, in addition to *malonazidic acid* (B), contains free malonic acid; it slowly evolves CO_2 and N and after a time gives a ppt. of AgN_3 with AgNO_3 even in the cold, indicating that hydrolysis is produced by the moisture, so that B cannot be isolated pure. By the action of alc. on the crude B the expected $\text{HO}_2\text{CCH}_2\text{NHCO}_2\text{Et}$ cannot be obtained pure; under varied conditions CO_2 and N are evolved and the resulting residues on treating with alc. HCl all give pure $\text{HCl.H}_2\text{NCH}_2\text{CO}_2\text{Et}$ (C). When the Et_2O soln. of B from 5 g. A is allowed to evap. in a desiccator the residual B gradually decomp. with gas evolution, turns brownish and on the following day leaves a dry cryst. ppt., which darkens about 200° , does not m. 260° , dissolves in great part in cold H_2O with evolution of CO_2 and formation of an acid soln. It is probably *glycine-N-carboxylic acid*, $\text{HO}_2\text{CCH}_2\text{NHCO}_2\text{H}$, or its "*isatoic anhydride*." When four 5-g. portions of A are treated with NaNO_3 and HCl as above (except that no Et_2O is used), allowed to stand 2 hrs., evapd. to dryness on the H_2O bath (N and CO_2 are evolved), extd. with 100 cc. alc. HCl, powdered, again digested 0.5 hr. with 100 cc. hot alc. HCl, filtered from the KCl and NaCl (no NH_4Cl is present) and cooled, there is obtained 40-4% of C, together with a small amt. of $\text{CH}_2(\text{CO}_2\text{Et})_2$. *Methylmalonazidic acid*, prep'd. like B, remains on evapn. of the Et_2O soln. as an acid oil giving no ppt. with AgNO_3 , decomp. very slowly on standing, with evolution of CO_2 and N, solidifies after a day in the desiccator to a semisolid cryst. mass yielding pure $\text{HCl.H}_2\text{NCHMeCO}_2\text{Me}$ with HCl in MeOH. The latter, m. $155-7^\circ$, is also obtained in 11-g. yield directly from 20 g. $\text{KO}_2\text{CCHMeCONHNH}_2$ in the same way C is prep'd. from A'

CHAS. A. ROUILLER

The saponification of oxamidic esters. ANTON SKRABAL AND GRETE MUHRY. Univ. Graz. *Monaish.* 42, 47-62 (1921).—The alk. sapon. was carried out with Na_2HPO_4 and the progress of the reaction followed by titration of the yet-present Na_2HPO_4 with 0.1 N HCl and Me orange. The value for k_A for the Me ester was found to be 48000, for the Et ester 22000. The acid hydrolysis (with 0.1 N HCl) gave values of k : Me ester 0.0020, and Et ester 0.0015. The remainder of the paper is devoted to a discussion of the influence upon the reactivity of one group of a sym. di-ester of changing the other group.

C. J. WEST

Course of the reaction between malonitrile and nitrous acid. OTTO DIELLS AND ERICH BORGWARDT. *Ber.* 54B, 1334-43 (1921).—When 10 g. $\text{CH}_2(\text{CN})_2$ are gently warmed with 20 g. freshly distd. AmNO_2 and 30 cc. alc. until a clear soln. results, cooled to 0° and treated with 9.2 g. Ns in 12 parts cold abs. alc., a faintly yellow substance seps. (21-2 g. after 1.5 hrs.) which is pressed on clay and cautiously added to 90 cc. of 50% ice-cold AcOH , whereby it is immediately converted into a deep yellow compound $\text{HON:C}(\text{CN})\text{C}(\text{OEt})(\text{OH})\text{NH}_2$ (A) which seps. from ice-cold dil. NaOH just made acid with AcOH , on rubbing, in long yellow prisms, gradually becomes orange-red *in vacuo* over P_2O_5 , turns brick-red 90° , decomp. about 110° . When boiled with 95% alc. it dissolves at first but in a few moments the soln. becomes turbid and begins to deposit a yellow granular cryst. powder sepg. from H_2O in very characteristic yellow crystals turning brown at 240° , decomp. about 321° , sol. in NaOH with loss of NH_3 ; the compound (B) is provisionally assigned the structure

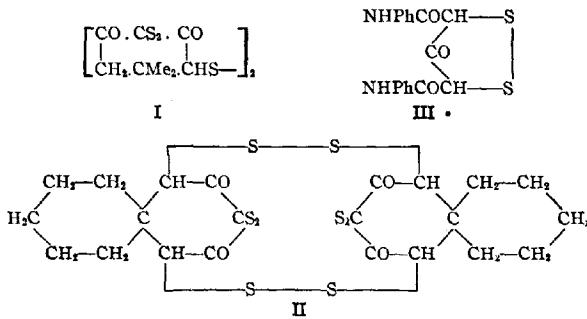


$\text{HON:C}(\text{CN})\text{C}(\text{NH}_2).\text{NH.C}(\text{NH}_2)\text{C}(\text{CN}): \text{NOH}$. The alc. mother liquor from the crude B on evapn. yields a compound $\text{NH}[\text{C}(\text{OH})(\text{OEt})\text{C}(\text{CN}): \text{NOH}]_2$ (C), prisms from alc., siners 152° , m. 153.5° (decompn.), 2 g. of which warmed with 2 cc. concd. NH_4OH

yields on cooling 1.3 g. of the NH_4 salt, m. 145°, of $\text{HON:C(CN)CO}_2\text{Et}$, while 2 g. of the C treated with 2 cc. fuming HCl and then warmed with 2 cc. H_2O gives 1.7 g. of the free $\text{HON:C(CN)CO}_2\text{Et}$, m. 129°. Likewise, 2 g. A rubbed with 2 cc. HCl (d. 1.19) and then warmed with 2 cc. H_2O yields 1.3 g. $\text{HON:C(CN)CO}_2\text{Et}$. If 9 g. of A is treated with 27 cc. of 25% NH_4OH , filtered and gently warmed 5–10 min. it gives 5 g. C, the ammoniacal filtrate from which on concn. deposits 0.9 g. of a compound probably having the structure $\text{NH}[\text{C(OH)(NH}_2\text{)C(CN):NOH}]_2$, crystals from dil. MeCN , m. 198° (decompn.), converted by warm HCl (d. 1.19) into HON:C(CN)CONH_2 , m. 183° (decompn.). C (2 g.) heated with 5 cc. H_2SO_4 (d. 1.16) gives 2.45 g. of a sulfate, $\text{C}_1\text{.5H}_2\text{SO}_4\text{.1.5H}_2\text{O}$, felted needles, m. 203–4°, which regenerates C when neutralized in H_2O with soda. Warmed with 5 cc. HCl (d. 1.19) until a clear soln. results, 5 g. C loses 1 mol. NH_3 and yields 4 g. of a salt $\text{C}_8\text{H}_{11}\text{O}_4\text{N}_2\text{.3HCl}$, turns brown about 180°, m. around 195° (decompn.) which, neutralized in H_2O with soda, gives the free base, yellow octahedrons from H_2O , turns brown about 280°, decomp. around 316°. From 2 g. C boiled with 9 cc. Ac_2O and allowed to stand 5 days is obtained 1.9 g. of a compound having the compn. $\text{C}_8\text{H}_8\text{O}_4\text{N}_2$, mol. wt. in freezing AcOH 201, of a *diacetylisonitrosocyanacetamide*, crystals from C_6H_6 , m. 122°, loses AcOH when boiled with H_2O and passes over into a *monoacetyl derivative*, serrated leaflets from H_2O , m. 207°. Shaken vigorously in 16 cc. of cold 8% NaOH with 2.28 g. Me_2SO_4 and allowed to stand 15 min. at 0°, 2 g. C gives 0.7 g. *isonitrosocyanacetamide methyl ether*, long felted needles from H_2O , m. 172°, also obtained from HON:C(CN)CONH_2 in 3–5 parts of 5% KOH shaken with the calcd. amt. of Me_2SO_4 and allowed to stand 1 hr. in ice. C (5 g.) warmed with 12 cc. of 30% NaOH until the evolution of NH_3 ceases, cooled a short time in ice, filtered and acidified with dil. HCl gives about 1 g. of $\text{HON:C(CONH}_2)_2$, slender prisms from H_2O , turns brown 180–5°, decomp. suddenly somewhat above 200°. CHAS. A. ROUILLER

Formation and properties of dithioketones ($\text{R}_2\text{CS : S}$) and dithioethers (RS : S). II. Kuverji GOSAI NAIK. Imp. College Sci. Tech. *J. Chem. Soc.* 119, 1231–42 (1921); cf. *C. A.* 15, 2072.—The reaction of S_2Cl_2 with compds. contg. the CH_2 radical depends upon the nature of the groups attached to the other 2 valencies. If neutral no reaction occurs. The speed of the reaction appears to depend upon the electronegative character of the groups. *Dithiomesoxo-p-toluidide*, $\text{C}_7\text{H}_9\text{O}_2\text{N}_2\text{S}_2$, from 10 g. $\text{CH}_3(\text{CONHC}_4\text{H}_4\text{Me})_2$, 5 g. S_2Cl_2 and 100 g. C_6H_6 by heating for 3 hrs., m. 215–6°. *Tetranitro derivative*, $\text{C}_7\text{H}_9\text{O}_4\text{N}_6\text{S}_2$, by dissolving the thio compd. in HNO_3 (d. 1.5) by warming, m. 255° (decompn.). *Dithiomesoxo-o-toluidide*, fibrous needles from C_6H_6 -petr. ether, m. 189–90°. *Tetranitro derivative*, yellowish white powder, m. 165° (decompn.). *Dithiomesoxo- α -naphthylamide*, $\text{C}_9\text{H}_9\text{O}_2\text{N}_2\text{S}_2$, pale red needles, m. and decomp. 210°. *Tetranitro derivative*, orange-red powder, decomp. 190°. *Hexanitro derivative*, recovered from the washings by diln. with H_2O , yellow, decomp. 135°. *Dithiomesoxo- β -naphthylamide*, decomp. 204°. *Tetranitro derivative*, pale yellow powder, decomp. 195°. *Dithiomesoxomonoo-p-toluidide*, $\text{C}_{10}\text{H}_{11}\text{O}_2\text{N}_2\text{S}_2$, short needles, clears at 150°, decomp. 165°. *Dithiomesoxo-monophenylamide*, $\text{C}_8\text{H}_9\text{O}_2\text{N}_2\text{S}_2$, short needles, m. 202° (decompn.). *Ethyl dithiomesoxo-p-tolylamide*, $\text{C}_{11}\text{H}_{13}\text{O}_2\text{NS}_2$, m. 90°. The *o-derivative*, m. 62°. *Methylmalono-p-toluidide disulfide*, $[\text{SCMe}(\text{CONHC}_4\text{H}_4\text{Et})_2]_2$, from *methylmalono-p-toluidide*, m. 220°, and S_2Cl_2 , m. 224–5°. *Dodecanitro derivative*, pale yellow powder, decomp. 140°. *Methylmalono-o-toluidide*, m. 161°. The *disulfide* forms mealy crystals, m. 174°. *Methylmalonomono-o-toluidide disulfide*, $\text{C}_{20}\text{H}_{22}\text{O}_4\text{N}_2\text{S}_2$, was prep'd. from *methylmalonomono-o-toluidide*, pearly scales from alc., m. 117°, in the usual way and m. 207–8°. *Methylmalonodimethylamide disulfide*, $\text{S}_2[\text{CMe}(\text{CONHMe})_2]_2$, m. 200°. $\text{CNCHNaCO}_2\text{Et}$ or $\text{CNCH}_2\text{CO}_2\text{Et}$ and S_2Cl_2 in C_6H_6 gave Et dicyanosuccinate. In the same way $\text{CH}_2(\text{CO}_2\text{Et})_2$, $\text{CHNa}(\text{CO}_2\text{Et})$, and S_2Cl_2 gave a product with no S in it. *3,5,3',5'-Tetraketo-4,4'-bisdithio-1,1',1'-tetramethylidicyclohexyl 2,2'-disulfide* (I), from the ketone and

S_2Cl_2 , softens 110°, decomp. 150°. ι, ι' -Dicyclohexanespiro-3,5,3',5'-Tetraketo-4,4'-bisdithiodicyclohexylene 2,2',6,6'-bisdisulfide (II). decomp. 155°. Cyclopentanespiro-3,5-diketo-4-dithiocyclohexane, softens 114°, m. 135°. α, γ -Disulfidoacetonedicarboxydi-anilide (III), golden yellow, m. 220°. Ethyl γ -phenylcarbamyl- α, γ -bisdisulfidoacet-



acetate, $CO[C(S_2)COPhNH]_2$, sinters 115°, decomp. 156-7°. Acetonedicarboxydi- ρ -toluidide, $C_{19}H_{26}O_4N_2$, m. 169-70°. α, γ -Disulfido derivative, $C_{19}H_{18}O_4N_2S_2$, brilliant, golden yellow flakes, m. 216-7°. Acetonedicarboxydi- ρ -toluidide, m. 167°. The disulfido derivative forms brilliant orange crystals, decomp. 225°.

C. J. WEST

Experiments on the synthesis of the polyacetic acids of methane. II. Some abnormal condensations of malonic and cyanoacetic esters with halogenated methanes. CHRISTOPHER KELK INGOLD AND WALTER JAMES POWELL. Imp. Inst. Sci. Tech., South Kensington. J. Chem. Soc. 119, 1222-31 (1921); cf. C. A. 15, 1698.—The successful prepn. of $CH(CH_2CO_2H)_3$, led to the attempt to synthesize $C(CH_2CO_2H)_4$. This should be possible by the use of $(CO_2Et)_2C:C(CO_2Et)$ (Ber. 27, 3374). On repeating Zelinsky and Doroshevsky's work, it was found that the product was not the above but $CO_2EtC:CH.CCO_2Et$, identified by hydrolysis to glutaconic acid. The production

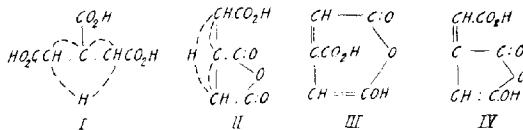


of these substances was not due to $CHCl_3$ in the CCl_4 ; the source of the 2 H atoms is obscure but it may be the oxidation of alc. Other condensations were attempted in order to try to find an explanation of the above reaction. CCl_4 was purified by distn., by digestion with Fehling soln., alc. KOH, or $CHNa(CO_2Et)_2$. $EtONa$ (4 mols.) and CCl_4 were boiled for 48 hrs., concd., poured into H_2O , extd. with Et_2O and the ext. was distd., when unchanged CCl_4 and a large amt. of $CH(OCH_3)_2$ were obtained. $CHNa(CO_2Et)_2$ and CCl_4 gave ethyl sodiodicarboxyglutaconate, bright yellow needles, which gave $(CO_2Et)_2C:CHCH(CO_2Et)_2$ upon hydrolysis. $CNCHNaCO_2Et$ and CCl_4 , heated at 100° for 4 hrs., gave $CO_2Et(CN)CHCH:C(CN)CO_2Et$, $CO_2EtCH_2C(:NH)CH(CN)CO_2Et$, and $CNCH_2CONH_2$. The formation of these compds. may be explained by the liberation of $CNCH_2CO_2Et$ during the condensation, and its combination with some of the unchanged Na deriv. The use of CBr_4 or CCl_4NO_2 with $CHNa(CO_2Et)_2$ or with $CNCHNaCO_2Et$ gave, as the principal product, Et ethanetetracarboxylate or Et dicyanosuccinate.

C. J. WEST

Aconitic acid. I. Preparation and properties of the hydroxyanhydro acid. P. E. VERKADE. Univ. comm. néerlandaise, Rotterdam. Rec. trav. chim. 40, 381-6 (1921).—Two anhydro acids of "normal" aconitic acid are known. One (I) is obtained by boiling citric acid with 66% H_2SO_4 and when heated rapidly m. 191° (decompn).

(Thorpe, Rogerson, *J. Chem. Soc.* **89**, 631 (1906)). One part by wt. of I heated with 2 parts AcCl (with or without 5 parts abs. CHCl_3) until completely dissolved (Anschütz, Bertram, *Ber.* **37**, 3967 (1904); Bland and Thorpe, *C. A.* **7**, 591) gives an anhydride acid, $\text{C}_4\text{H}_6\text{O}_5$, m. 76° , having the probable structure II, which on hydration gives I and on heating to 170° easily gives itaconic anhydride. B. and T. observed that boiling finely powdered I with pure AcCl (+ CHCl_3) as described above for 8 hrs. gives cryst. needles of an hydroxyanhydride acid (III) or (IV), m. 135° , which by hydration with NaOH gives an unstable isomer (A) of I, m. 173° . Of the 2 formulas IV is most probable since on heating this compd. 10 mins. it is converted into II, m. 76° . If the pure AcCl is replaced with a product containing PCl_5 II but no IV was obtained. V. has extended these observations. 40 g. finely powdered I heated under a condenser with 80 g. carefully purified AcCl + 200 g. dry CHCl_3 gave the typical color reactions for IV (yellow-green color in H_2O , red-brown color with FeCl_3). After 1-1.5 hrs. the evolution of HCl is complete and 25-30 g. (70-85% yield) nearly pure IV sept., m. 135° . The same result was obtained with pure AcCl from another source. When heated longer IV gradually dissolves, which explains why B. and T. obtained a 45% yield after heating 8 hrs., and



V. also isolated II from such solns. When the same expts. were done with AcCl containing 2.5% PCl_3 the results showed a little less IV after heating 1-1.5 hrs. but on continued heating the transformation into II was much more rapid, which explains why B. and T. failed to obtain IV after heating 8 hrs. under these conditions. The results may be summarized thus: (1) I (m. 19 $^{\circ}$) \longrightarrow A (m. 173 $^{\circ}$); (2) A \longrightarrow IV (m. 135 $^{\circ}$); (3) IV \longrightarrow II (m. 76 $^{\circ}$). In this case the "normal" anhydro acid II is the stable end product and not the hydroxyanhydro acid as with the alkylglutaconic acids (Thole and Thorpe, *C. A.*, 6, 1151). That reaction (3) is catalytically accelerated by small amounts of PCl_3 was confirmed by special expts. in which it was found that 5% PCl_3 reduced the reaction time in (3) about one half. This catalysis is not explained but it is suggested that with the aid of the views of Prins (*C. A.*, 8, 2695, 2702; 12, 329) on the theory of activation, the chloroanhydrides may be of interest in this connection. Reactions (1) and (2) are not catalyzed by PCl_3 . The formation of A (m. 173 $^{\circ}$) was not proved but the results of B. and T. make its formation probable. 40 g. I + 80 g. Ac_2O + 200 g. dry CHCl_3 heated 1 hr. at 40° seps. 18 g. (60% yield) of IV. From the mother liquors II was sepd.

E. J. WITZEMANN

Cupritartrates. JOHN PACKER AND JAN WILLIAM WARK. Univ. Melbourne. *J. Chem. Soc.* 119, 1848-55 (1921); cf. Masson and Steels, *Ibid* 75, 725.—In view of conflicting reports concerning the properties of the cupritartrates, the neutral and alk. salts have been reinvestigated. The α -cupritartrates, $X_3Cu_4C_12H_9O_9$, are the most stable of all the cupritartrates, showing no signs of decompn. in solid state or soln. The solns. are stable to CO_2 , are not affected by boiling nor will they oxidize glucose. It appears that the more alkali the tartrates contain, the more unstable they are and the more readily hydrolyzed in soln. This is parallel to the NH_4 compds. **Sodium α -cupritartrate**, $Na_3Cu_4C_12H_9O_9 \cdot 11H_2O$, pptd. by adding 2 vols. alc. to 1 vol. of a satd. soln. of $Cu_2H_4O_4$ in $N/3 NaOH$: 4 $Cu_2H_4O_4$ and washing with 65% alc., blue. **Barium salt**, $Ba_3(Cu_4C_12H_9O_9)_2 \cdot 27H_2O$, pale blue, by double decompn. of $BaCl_2$ and $Cu_2C_4H_4O_4$. **Ammonium salt** ($NH_4)_3Cu_4C_12H_9O_9 \cdot 9H_2O$, prep'd. by adding abs. alc. to

a satd. soln. of $\text{CuC}_4\text{H}_4\text{O}_6$ in NH_4OH until incipient crystn. occurred, hygroscopic blue crystals. *Ammonium β-cupritartrate*, $(\text{NH}_4)_2\text{Cu}_3\text{C}_8\text{H}_8\text{O}_{10} \cdot 6\text{H}_2\text{O}$, obtained under conditions not defined, but apparently with less concd. NH_4OH and less satd. soln. *Alkaline ammonium cupritartrate* (Schiff's salt), $\text{Cu}(\text{NH}_3)_4\text{C}_4\text{H}_4\text{O}_6 \cdot \text{H}_2\text{O}$, by adding alc. to a soln. containing excess of NH_3 , violet-blue, easily dissociated crystals; also prepd. by the action of dry NH_3 gas on the neutral salt. A very large number of alk. alkali-metal compds. exist but they are as a rule very unstable. All are able to oxidize glucose. *Sodium cupritrate-B*, $7\text{NaOH} \cdot 4\text{CuC}_4\text{H}_4\text{O}_6 \cdot 7\text{H}_2\text{O}$ by dissolving $\text{CuC}_4\text{H}_4\text{O}_6$ in NaOH in the proportion of 2NaOH to $1\text{CuC}_4\text{H}_4\text{O}_6$, and adding alc., blue, extremely hygroscopic crystals, decomp. in air to give a green oily substance, setting to a green enamel-like solid. An attempt to prepr. the corresponding *potassium salt* gave a compound, $\text{K}_2\text{Cu}_5\text{C}_{16}\text{H}_{22}\text{O}_{16}$, or $4\text{KOH} \cdot 4\text{CuC}_4\text{H}_4\text{O}_6 \cdot \text{Cu}(\text{OH})_2 \cdot 15\text{H}_2\text{O}$. A more alk. compd. was prepd. by dissolving $\text{CuC}_4\text{H}_4\text{O}_6$ in NaOH in the proportion of 1:6, deep blue, stable on boiling the soln., readily oxidized glucose and decompd. within a week or so. The complex formula suggested is $\text{Na}_{23}\text{Cu}_3\text{C}_{28}\text{H}_{36}\text{O}_{16}$ (?). The dark blue complex formed when $\text{CuC}_4\text{H}_4\text{O}_6$ dissolves in Rochelle salt, $\text{Na}_2\text{C}_4\text{H}_4\text{O}_6$ or $\text{K}_2\text{C}_4\text{H}_4\text{O}_6$, is apparently stable only in the presence of a high concn. of the alkali-metal tartrate. $\text{BaC}_4\text{H}_4\text{O}_6$ is also sol. in solns. of $\text{Na}_2\text{C}_4\text{H}_4\text{O}_6$.

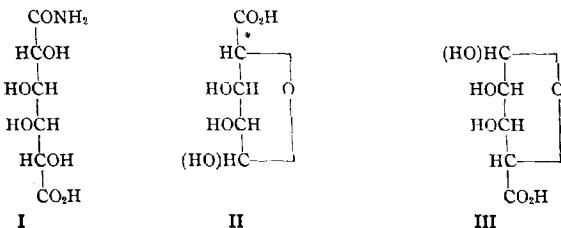
C. J. WEST

Oxidative degradation of mucic acid and saccharic acid to new aldehyde acids of the sugar group. M. BERGMANN, Kaiser-Wilhelm-Inst. f. Faserstoff-Chem., Berlin-Dahlem. *Ber.* **54B**, 1362-80 (1921).—*dl-Mucic monamide* (A), 4-sided microtables, begins to turn brown 175°, foams 192°, is obtained in 31-g. yield by boiling 60 g. mucic acid about 0.5 hr. with 4 l. of H_2O to convert it into the lactone, concg. the soln. as quickly as possible to about 0.1 its original vol., removing the pptd. mucic acid (about 15 g.), at once evapg. *in vacuo* at 40-50° to a thick sirup, treating with 200 cc. concd. NH_4OH , adding alc. after 1 hr., letting stand for a short time, filtering, dissolving the voluminous NH_4 salt in cold H_2O , acidifying dropwise to Congo with fuming HCl and crystg. from 1 l. H_2O . The *sodium, ammonium, barium* and *calcium salts* are easily obtained in needles, while the *lead* and *silver salts* are not distinctly cryst. A does not reduce Fehling soln. and the Ag salt darkens only slowly when boiled with H_2O ; with boiling alkalies, NH_3 is evolved abundantly. The *brucine* and *cinchonine salts* also cryst. well but seem only little adapted to the resolution of the A into its active components. From 50 g. A, suspended in 150 cc. Ac_2O , treated with 3 cc. concd. H_2SO_4 , shaken continuously until the temp. begins to fall, heated 5 min. on the H_2O bath, cooled and rubbed with 100-50 cc. AcOEt is obtained 100 g. of the *pentaacetyl derivative*, 4-sided elongated tables with 1 mol. solvent from 2 parts H_2O , decomp. 197°; 10 g. dissolved in 100 cc. hot alc. with 0.5 mol. brucine, then cooled to 0° and rubbed or seeded, yields 7 g. of the *brucine salt* of the *d-form*, $\text{C}_{39}\text{H}_{47}\text{O}_{16}\text{N}_2 \cdot 2\text{H}_2\text{O}$, $[\alpha]_D^{20}$ (anhydrous) -29.8° to -30.0° in 2.5% aq. soln.; 10 g. vigorously shaken in 25 cc. H_2O with 15 cc. of 25% NH_4OH , dild. after 15 hrs. with 25 cc. H_2O , freed from the brucine by 2 extns. with CHCl_3 and slowly acidified to Congo in the cold with concd. HCl gives 2.4 g. of the free *d-amide*, heavy powder, $[\alpha]_D^{17}$ 23.8° in 1 mol. of 0.25 N NH_4OH . When a suspension of 20 g. A in 250 cc. H_2O is treated slowly with 100 cc. of 1 N NaOH , then with 1 cc. AcOH , 4 cc. of 1% $\text{Fe}(\text{OAc})_3$, 0.4 g. FeSO_4 and 24 cc. of 30% H_2O_2 , heated not higher than 55° for 10-5 min., cooled, treated with 95 cc. of 1 N H_2SO_4 or the corresponding amt. of concd. HCl , concd. *in vacuo*, filtered from any A and evapd. below 40°, there is obtained a mixt. of much Na_2SO_4 with various substances which reduce Fehling soln. This is heated 5 min. on the H_2O bath with continuous shaking with glass beads with 80 cc. Ac_2O and 3 cc. concd. H_2SO_4 , and treated with 0.5 l. cold H_2O ; if the operation has been successful the clear dark brown soln. will deposit in a few min. up to 4 g. of *tetraacetylxyuronamide*, microneedles or prisms, sinters 170°, becomes brown, m. about 217°; 5 g. shaken with

50 cc. MeOH satd. at 0° with NH₃ and allowed to stand overnight gives 2-2.2 g. of *lyxuronamide osamine*, $O\cdot CH(NH_2)\cdot CH(OH)\cdot CH(OH)\cdot CHCONH_2$, 4-sided tables

from H₂O-MeOH, quickly splits off NH₃ with hot mineral acids, reduces hot Fehling soln. strongly; *hydrochloride*, 6-sided tables or prisms, begins to turn brown 140°, decomps. about 158°; *sulfate*, elongated 6-sided leaves. Either the acetylated amide or the above osamine when treated with very dil. hot mineral acids gives a soln. which after removal of the inorg. acid contains *dl-lyxuronic acid* (B) in the form of its NH₄ salt. It has not been possible thus far to obtain either B or any of its salts in cryst. form. It powerfully reduces hot Fehling soln. and NH₄-AgNO₃, is decompd. by alkalies, especially on heating, with production of yellow and brown colors, also by concd. acids with formation of dark brown humin-like substances; its response to the usual color tests for glucuronic acid and similar substances is generally less characteristic, giving with orcinol-HCl only a dirty green-brown; the behavior towards phloroglucinol is even less specific; in the Tollen's naphthoresorcinol test extn. of the dirty gray or greenish ppt. with Et₂O gives only a reddish brown to wine-red Et₂O soln. which, however, has a strong violet-blue and the aq. layer a green fluorescence; if the B soln. is allowed to stand a short time with very dil. alkali the Et₂O layer then often shows as bright a red or blue-red color as in the case of glucuronic acid. The acetylamide or the osamine treated on the H₂O bath with 20-30 parts *N* HCl, whereby the NH₂ group is rapidly split off, then with NaOAc to tone down the acidity, next with 4 parts PhNH₂H, in the same amt. of 50% AcOH and heated on the H₂O bath 30-45 min. gives 70-80% of *phenylhydrazine lyxuronate phenylosazone* (C), PhHN:CHC(:NNHPh)CH(OH)CH(OH)CO₂H.NH₂NHPh, very light pure yellow microneedles from the soln. in 400 parts H₂O and 10 parts PhNH₂H treated with 10 parts of 50% AcOH, m. about 164° (foaming), colored red-brown by acids, brown by alkalies, converted even by AcOH in the cold into the free *acid osazone*, microneedles with 2H₂O from 90% AcOH, m. about 170° (decompn.). From 1 g. of the acetylamide hydrolyzed with *N* HCl, treated with NaOAc and shaken with 2 g. PhCH₂NPhNH₂ is obtained 1.2 g. of *benzylphenylhydrazine lyxuronate benzylphenylhydrazone* (D), microneedles from Et₂O-petr. ether, containing 1H₂O more than calcd. but as this H₂O cannot be removed even in a high vacuum at 36° it is uncertain whether it is H₂O of crystn. or of constitution; it m. 88-9°, is immediately decompd. by dil. mineral acids and alkalies. B is also obtained by warming 5 g. A a short time with 100 cc. H₂O and 5 g. crystd. NaOAc, cooling, adding 4.5 g. Br and then, slowly and with const. stirring, in the course of a few min., KOH in small portions until the soln. is decolorized (12 cc. of about 30% KOH). The soln. obtained in this way from 2.5 g. A yielded 1.5 g. C or 2 g. D, while that from 5 g. A heated 0.5 hr. with 5 g. *p*-BrC₆H₄NH₂H and 40 cc. of 50% AcOH gives a compound, C₁₇H₁₅O₃N₃Br₂·2H₂O, analogous to D, intensely yellow microprisms or flat needles, sinters 200°, decomp. 204°. B. never succeeded in isolating *dl-lyxuronamide* as the tetra-Ac deriv. but when 5 g. of d-A is treated with H₂O₂ as above and the resulting brown aq. soln. is shaken with 2 g. PhCH₂NPhNH₂ in 15 cc. Et₂O, the *hydrazone* PhCH₂NPhN:CH[CH(OH)]CONH₂, needles from AcOEt-petr. ether, begins to sep. after a time; heated 15 min. on the H₂O bath with *N* HCl, shaken with Et₂O to remove the suspended oil, neutralized with NaOAc, again extd. with Et₂O and treated hot with PhNH₂H and AcOH it gives, but in poor yield, an *osazone* (E), pure bright yellow crystals from aq. PhNH₂H-AcOH, $\alpha = -0.30^\circ$ in a 1-dcm. tube in aq. C₆H₆N. Oxidation of d-A with KOBr, on the other hand, yields an *osazone* with $\alpha = -0.24^\circ$. K saccharate (10 g.) in 40 cc. *N* NaOH treated with 3 cc. Fe(OAc)₃ (1:100), 0.2 g. FeSO₄ and 50 cc. com. 3% H₂O₂, heated a few min. to 50° and treated with 15 g. PhNH₂H and 20 cc. of 50% AcOH at 90-100° gives 5-6 g. of the active *osazone salt* C₂₂H₂₆O₄N₆, identical with E, long canary-yellow needles

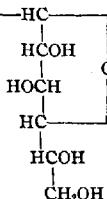
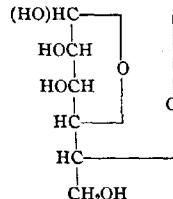
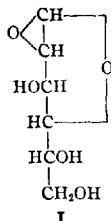
from $\text{PhNNNH}_2\text{-AcOH}$, decomp. about 164° . *Saccharic monoamide* (3.4 g. from 6 g. of the lactone in 60 cc. concd. NH_4OH allowed to stand 1 hr. at 0° , concd. to a few cc. *in vacuo*, treated at 0° with HCl in 60-70% alc., then with much alc. and allowed to stand 24 hrs.), needles, m. 135° (foaming), $[\alpha]_D^{19} 22.5^\circ$ (H_2O). Since the amide of B is obtained in the degradation of A by H_2O_2 , it must be the CO_2H , not the CONH_2 end of the mol. of A which is oxidized away. But the same B is formed from A by the action of KOBr , a reaction in which, according to the observations of Weermann (C. A. 12, 1463), it is chiefly the CONH_2 group which is oxidized away. A having the structure I, the product obtained with H_2O_2 would have the structure II, that with KOBr the structure III. Starting with *dl*-A, each of the products II and III would be a mixt. of the 2 antipodes, but starting with an active form of A, the product obtained with H_2O_2 should be the antipode of that formed with KOBr and, as shown above, such is the case; the fact that the rotation of the product obtained by the KOBr method is numerically smaller (0.24°) than that of the H_2O_2 product E (-0.30°) shows that the KOBr does not act exclusively on the CONH_2 but also attacks the CO_2H end to some extent and thus yields a product containing some of the *dl*-form. The fact that the degradation of saccharic acid with H_2O_2 gives an acid whose osazone salt is identical with that (E) obtained from A shows that, in part at least, it is that end of the saccharic acid mol. which in glucose carries the primary alc. group which is attacked in the degradation.



CHAS. A. ROUILLER

Unsaturated reduction products of the sugars and their transformation products.
II. New anhydrosugars. Synthesis of a glucosidomannose. Structure of cellobiose.
 MAX BERGMANN and HERBERT SCHOTTE. Kaiser-Wilhelm-Inst. f. Faserstoff-Chem., Berlin-Dahlem. *Ber.* **54B**, 1564-78(1921); cf. C. A. 15, 2520.—In the earlier paper, in which the structure of glucal (A) was established by its conversion by means of benzoic peracid (B) into mannose, it was suggested that the intermediate product was anhydromannose (I). The isolation of this product is difficult on account of its great sensitiveness to H_2O and solvents containing HO groups. If, however, 5 g. triacetyl-glucal is converted with NH_3 in MeOH into the free A and treated in ice with an AcOEt soln. of somewhat more than 1 mol. B in small portions it changes into a viscous mass (I) which with H_2O gives mannose, whereas if the I is treated in the cold with 25 cc. dry MeOH , evapd. after a time and taken up in Et_2O and H_2O and the H_2O layer is again evapd. and treated with abs. alc. it gives almost 60% (based on the amt. of triacetyl-glucal used) of α -Me rhamnoside, m. $191-2^\circ$, $[\alpha]_D^{19} 79^\circ$. Similarly the product obtained from rhamnal and B in AcOEt gives with H_2O rhamnose and with MeOH 50% (based on the diacetyl rhamnal used) of α -Me rhamnoside, isolated as the triacetate, m. 87° , $[\alpha]_D^{19} -53.5^\circ$. Again, from hexaacetylcellobial (C) (obtained in 70% yield from 30 g. acetobromocellose, 500 cc. of 90% AcOH , 200 g. Zn dust and 2 drops of 0.5% PtCl_4), converted by NH_3 in MeOH into the free cellobial, treated in about 10 parts

H_2O with somewhat more than 1 mol. **B** in AcOEt and shaken until the aq. layer no longer adds Br (2-3 hrs.), the H_2O soln. then being evapd. *in vacuo* to a thin sirup and treated with abs. alc. to incipient turbidity and then with Et_2O , is obtained 90% of *5-glucosidomannose* (**II**) (in naming the disaccharides the sugar residue whose aldehyde group is involved in the saccharide formation is considered as a substituent of the second sugar), crystals with $1\text{H}_2\text{O}$, $[\alpha]_D^{20} 12.37^\circ$ (H_2O) 7 min. after soln., becoming const. at 9.72° in 2 hrs., m. (anhydrous) $175-6^\circ$, tastes very faintly sweet, reduces Fehling soln. and $\text{NH}_3\text{-AgNO}_3$, very slowly colors fuchsin- SO_2 a faint red, gives with PhNH_2 and AcOH at 100° cellobiosazone, m. 198° , in excellent yield, forms no difficultly sol. phenylhydrazone, yields after 2.5 hrs. hydrolysis with $N\text{ HCl}$ at 100° 89% mannose (isolated as the phenylhydrazone, m. $197-201^\circ$) and 67% glucose (as the osazone, m. $213-5^\circ$), is slowly attacked by emulsin, gives quant. with Ac_2O and $\text{C}_6\text{H}_5\text{N}$ an *octaacetate*, long pointed needles from alc., m. $196-7^\circ$, $[\alpha]_D^{17} 33.16^\circ$ (CHCl_3). The above process furnishes new method of prepn. of glucosides which, although still subject to certain limitations in its applicability, has an advantage over the other methods in the mildness of the conditions under which it is carried out. In the cases thus far studied it has always yielded α -glucosides and perhaps it may be possible to make use of this fact in interpreting the spatial arrangement of the substituents on the glucoside-forming C atom, as apparently no inversion phenomena occur in the passage from the anhydro-sugar to the glucoside. From the structure of the trimethylglucose obtained from methylated cellulose, Haworth and Leitch (*C. A.* 13, 2856) conclude that in cellobiose the second sugar residue is attached to C atom 5 but the assumption that the reducing grouping of cellobiose has a 1,4-O bridge remains unproved. The correctness of their view, however, is confirmed by the following reasoning: In the transformation of cellobiose into cellobial two HO groups of the disaccharide are replaced by a double bond; if this is catalytically hydrogenated and the product is decompd. with emulsin there is obtained the same hydroglucal as is formed by the direct reduction of **A**. The unsatd. complex of cellobial, therefore, has the same structure as **A**, *i.e.*, in its formation it is the HO groups on C atoms 1 and 2 which are involved in the production of the double bond and the furoid O bridge connects the atoms 1 and 4, so that the HO group at 4 (and naturally also those at 1 and 2) is excluded as the intermediary in the disaccharide union. Moreover, **C** contains in the **A** part of the mol. a labile Ac group; if 1.1306 g. of it is boiled with 40 cc. H_2O most of it dissolves and after 20 min. it requires at 0° 20.05 cc. of 0.1 *N* NaOH for neutralization to phenolphthalein (calcd. for 1 Ac, 20.18 cc.) and there seps. 84% of a compound $\text{C}_{12}\text{H}_{14}\text{O}_4\text{Ac}_6$, felted needles, sinters about 120° , m. $121-4^\circ$, $[\alpha]_D^{22} 44.43^\circ$ in (CHCl_3), seps. from AcOEt , CHCl_3 , Me_2CO or (CHCl_3), on addition of petr. ether in long fine needles, from alc. in tangled threads, from C_6H_6 in table-like prisms, powerfully reduces Fehling soln. and $\text{NH}_3\text{-AgNO}_3$, turns brown in hot alkalies (all signs that the characteristic grouping of cellobial has been changed), is very rapidly decompd. by mineral acids, gives a weak pine splinter reaction, adds Br only slowly (78.80 and 92.22% of 1 equiv. after 0.5 and 1 hr., resp., in CHCl_3), has a nauseating bitter taste, reddens 5% fuchsin- SO_2 intensely in a short time; 1 g. allowed to stand 15 hrs. with 2 cc. Ac_2O and 2 g. $\text{C}_6\text{H}_5\text{N}$ and poured into 20 cc. ice H_2O gives quant. a *hexaacetate*, long pointed needles from Et_2O , Me_2CO , AcOEt , CHCl_3 and alc., sinters 118° , m. $121-3^\circ$, greatly depresses the m. p. of **C**, reduces Fehling soln. and adds Br in CHCl_3 , even more slowly than the pentaacetate (73 and 81% of 1 equiv. after 0.5 and 1 hr., resp.), is very sensitive towards dil. mineral acids and alkalies, melts in boiling H_2O and regenerates the pentaacetate, gives on hydrolysis with $\text{Ba}(\text{OH})_2$, a c.yst. substance m. $175-6^\circ$, entirely different from cellobial and **II**. The theoretical bearing of these facts will be discussed shortly in connection with analogous expts. with **A**, the triacetate of which yields a strongly reducing compound $\text{C}_6\text{H}_{10}\text{O}_6$ m. $49-50^\circ$.



CHAS. A. ROUILLER

Acetolysis of polysaccharides. MAX BERGMANN AND FRANZ BECK. Kaiser-Wilhelm-Inst. f. Faserstoff-Chem., Berlin-Dahlem. *Ber.* **54B**, 1574-8(1921).—It seemed desirable to find, for the study of the polysaccharides, a hydrolyzing agent of such a nature that in the cleavage products the original point of union would be definitely fixed by the introduction of a characteristic substituent. In their first expts., which are still incomplete but are published in their present form because other investigators are working in the same field, B. and B. took up acetolysis with AcBr in the presence of much free HBr (and sometimes also of AcOH). Such a reagent can work in several ways which may change in different cases and may be systematically varied. It is in the first place, like pure AcBr, an acetylating but at the same time also a strong hydrolyzing agent and the cleavage products may furthermore be brominated. Depending on the nature of the original saccharide the entrance of the halogen may be limited to the aldehyde group involved in the glucoside formation, with the production of substances of the type of acetobromoglucose, or the alc. HO group taking part in the saccharide formation may also be simultaneously replaced by Br, the nature of the resulting brominated sugar permitting of drawing a direct conclusion as to the structure of the original glucoside. Thus, when 10 g. air-dried rice starch is covered with the mixt. obtained by satg. Ac_2O at 0° with HBr gas and shaken frequently, most of the starch dissolves in the first hr.; after 1-2 days the clear soln. is poured into ice H_2O , extd. with CHCl_3 , washed with H_2O , dried with CaCl_2 and evapd. *in vacuo*, giving 18.3 g. acetobromoglucose (A). Maltose (2 g.) with 34 cc. of the AcBr-AcOH-HBr mixt. dissolves completely in 1.5 hrs. and likewise yields more than 85% A. On the other hand 10 g. air-dried cellulose treated with 60 cc. of the reagent absorbs the latter completely; after a few hrs. a considerable part of the mixt. has liquefied and in 16 hrs. it has changed completely into a violet-brown soln. When this is poured after 2 days into ice H_2O and the pptd. flocks are extd. with CHCl_3 and the ext. is filtered and evapd. *in vacuo* there is obtained a light yellow sirup containing much A, which, however, cannot readily be made to cryst., but by treatment with AgOAc with moderate heating in AcOH there can be obtained 4.5 g. pentaacetylglucose and the filtrate from this on treatment with AcO_4 and $\text{C}_6\text{H}_5\text{N}$ in the cold yields another 2.5 g. of pentaacetylglucose (total, 40%); the mother liquors contain large amts. of brominated sugars; cellobiose and milk sugar behave exactly like cellulose. In order to test the behavior of the reagent towards non-furoid glucoside unions, 3 g. triacetyl- γ -methylrhamnoside (*C. A.* 15, 1521) was treated with 15 parts of the reagent; it at once formed a clear soln. and after 24 hrs. yielded 2.5 g. acetobromorhamnose, m. $71-2^\circ$, $[\alpha]_D^{20} -168.6^\circ$ in $(\text{CHCl}_3)_2$, which has the furoid structure (*C. A.* 15, 2420), so that the process is exactly the reverse of the formation of the triacetyl- γ -methylrhamnoside from acetobromorhamnose. C. A. R.

Polymerization of the glucosans. AMÉ PICTET AND JACQUES PICTET. *Compt. rend.* **173**, 158-60(1921); cf. *C. A.* 13, 313.—Glucosan heated with a little ZnCl_2 at 135° under 15 mm. pressure yielded diglucosan and at atm. pressure a tetraglucosan.

Diglucosan as formed is a white, amorphous, sweet, non-hygroscopic powder. Crystd. from glacial AcOH it yields microcrystals, m. 150° decompn. It is very sol. in water, slightly in MeOH, AcOH and pyridine and insol. in other org. solvents, $[\alpha]$ 54.8° (4.6% soln.), mol. wt. by cryoscopic method 310–355 (calcd. 324). Tetraglucosan is amorphous, non-sweet and rather hygroscopic, mol. wt. 630–45 (calcd. for $(C_6H_{10}O_6)_4$ 648). An analysis showed 2 mols. of combined water. Its other properties resemble those of the dextrins. It is not colored by I₂ nor pptd. from its aq. soln. by Na₂SO₄, (AcO)₂Pb, gallic acid or Br water, $[\alpha]$ 80.81° (2.97% aq. soln.) and 82.76° (4.35% soln.). Neither polymer reacts with PhNHNH₂ or reddens fuchsin-SO₄. They reduce slowly and but slightly cupro-potassic liquor and are not changed by boiling water. The absence of aldehyde properties of glucose and of the ethylene oxide group of glucosan is concluded. The authors suggest that the bonds between the C₆H₁₀O₆ groups are through the 1- and 2-C atoms of the glucose chain and unlike the polyamyloses from which they differ and which are bound through the 1- and either the 3-, 5- or the 6-C atom. The polymers hydrolyzed with boiling dil. (CO₂H)₂ yielded products which treated with PhNHNH₂ formed much phenylglucosazone and a little osazone decompd. during the cooling of the soln. which is a property characteristic of osazones of disaccharides. Also in *Heb. Chim. Acta* 4, 788–95 (1921)

R. L. B.

The fundamental organic substance of amylopectin. M. SAMEC AND ANKA MAYER. *Compt. rend.* 172, 1079–82 (1921).—The classification suggested for the products of hydrolysis of starch is: amyloses (without reducing power), dextrins (with reducing power), dextrin acids (with acid action), prefixing these names by amylo-, erythro-, or achroo-, according as they give blue, red, or no color with I. In this manner the carbohydrate derived from amylopectin will be classed as an erythromylose. J. C. S.

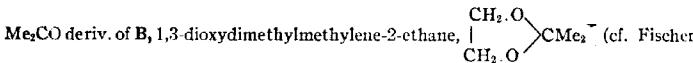
Lignin from rye straw. ERNST BECKMANN, OTTO LIESCHE AND FRITZ LEHMANN. *Z. angew. Chem.* 34, Aufsatzeil, 285–8 (1921).—The most suitable method for extg. lignin consists in digesting straw with a mixt. of 96% alc. and 2% NaOH, after which the soln. is neutralized with HCl, the alc. distd. off, and the product freed from hexosan and pentosan by treatment with HCl. Divergences in regard to the formula for lignin may be due to the various methods applied for its extn., as well as to secondary changes in the product. B., L. and L. consider that its compn. is most nearly represented by the formula C₄₀H₄₆O₁₅. The ratio of MeO:C in the product is about 1:10. The mol. wt., in boiling AcOH and C₆H₅N, and in freezing PhOH, gave values around 800. The HO groups were detd. by prep. aryl derivs. *Benzoyllignin*, C₃₆H₂₈O₁₀(OMe)₄Bz₄, was prep'd. by shaking 1 g. lignin in 20 cc. C₆H₅N with 4 cc. BzCl, and was purified by pouring into 200 cc. 25% H₂SO₄ and pptg. from C₆H₅N with Et₂O, brown powder. *p-Bromobenzoyllignin*, from 2 g. lignin, and 5.7 g. *p*-BrC₆H₄COCl in 30 cc. Et₂O, light brown amorphous product. *p-Nitrobenzoyllignin*, by treating 3.9 g. lignin in 80 cc. C₆H₅N with 18.4 g. *p*-NO₂C₆H₄COCl in 120 cc. Et₂O, amorphous, light brown powder. In these compds. the ratio C:OMe is 18:1. *Sodium lignate*, by evapg. the soln. to dryness, appears to contain 2 Na. All proposed formulas for lignin are listed with references.

C. J. WEST

The distinction and the separation of *cis* and *trans* cyclic 1,2-diols by means of acetone. Preliminary paper. J. BÖSEKEN AND H. G. DERK. Univ. Technique, Delft. *Rec. trav. chim.* 40, 519–24 (1921); cf. *C. A.* 15, 237.—In a study of the configuration of cyclopentanediols (A) and hydrindenediols (B) v. Loon (*Diss., Delft 1919*) prep'd. cyclic compds. from poly-HO compds. and Me₂CO and aldehydes (Fischer, *Ber.* 28, 1148, 2496 (1895)), in order to confirm the position of the OH groups. It was expected and found that the *cis*-diols form a dioxymethylene ring more easily than the *trans*-diols. This method applied to the cyclohexanediols (*C. A.* 14, 2472) showed that in this as well as with A and B the diol with the low m. p. is the *cis*- and the other the

trans-form. Moreover, these Me_2CO derivs. give their constituents easily on boiling with dil. acids so that their formation or non-formation is a convenient way of identifying and sepg. *cis* and *trans* cyclic diols. This method was used to det. the configuration of the diols that may be obtained from 1,2- and 2,3-dihydronaphthalenes in order to compare the result obtained with that obtained with H_3BO_3 , which failed to show increased cond. of H_3BO_3 with *cis*-cyclohexanediol while *cis*-cyclopentanediols and *cis*-hydrindenediols gave such an increase. A paper by Straus and Rohrbacher (*C. A.* 15, 1806), on the prepn. of tetrahydronaphthalenediols after this work was under way, gave rise to this preliminary report. The 4 tetrahydronaphthalene- α -glycols are known: **A** is derived from Δ^2 -dihydronaphthalene through the di-Br deriv., which with K_2CO_3 gives the compd., m. 135°; **B**, m. 120°, when the above di-Br deriv. is converted into the diacetate with AgOAc in AcOH and sapond. with KOH - EtOH . A mixt. of **A** and **B** in equimol. amts. m. 140°. Leroux (*C. A.* 5, 681) considered **A** and **B** to be isomers of which **A** is the *cis*-form because he had obtained it by hydration of the oxide, but the results of v. Loon (*l. c.*) show the argument to be valueless and the reverse to be probably true. **C** and **D** were obtained by oxidizing Δ^1 -dihydronaphthalene with $\text{Hg}(\text{OAc})_2$ and m. 112-3° and 102°, resp. S. and R. (*l. c.*) obtained both of these glycols by other methods but **B**, and **D**, consider their arguments for regarding the isomer that m. 102° as the *cis*-form as of little value. 18 g. of a mixt. of **A** and **B** (prep'd. according to L.) in 650 cc. Me_2CO containing 1% dry HCl was neutralized with NH_3 after 24 hrs. After filtering off NH_4Cl the Me_2CO was distd. off and the neutral residue distd. with steam. 7.55 g. of the acetone deriv. of the *cis*-glycol passed over. This was sapond. with HCl and gave **B**, m. 120°. The *trans*-isomer, m. 135°, remained in the distg. flask. The mixt. obtained by L. is accordingly a mixt. of equal amts. of **A** and **B**. 20 g. Δ^1 -dihydronaphthalene were agitated 24 hrs. with 105 g. $\text{Hg}(\text{OAc})_2$ in 500 g. H_2O . The HgOAc was sepd. by filtration. The soln. was freed from Hg with K_2CO_3 and the filtrate evapd. somewhat. The soln. was extd. with CHCl_3 and the ext. crystd. from PhMe . The 12 g. of mixed glycols obtained treated in Me_2CO (1% HCl) as above gave the acetone deriv. of the *cis*-form, b₂ 105°, $n_{D}^{18.5}$ 1.52613, $d_4^{18.5}$ 1.0812, which when boiled with HCl gave **D**, m. 102°. **C** was recovered unchanged from the distg. flask, m. 112-3°. The amts. of **C** and **D** are nearly equal. **B**, and **D**, have also undertaken to study the passage of some oxides of unsatd. cyclic hydrocarbons into the corresponding diols. E. J. W.

A new method for the determination of the relative position of hydroxyl groups in saturated glycols. Preliminary paper. J. BÖESEKEN AND P. H. HERMANS. Univ. Technique, Delft. *Rec. trav. chim.* 40, 525-28 (1921).—On the basis of the successful application of v. Loon's method to the detn. of the configuration of certain diols (*cf.* preceding abstr.) the method was applied to satd. noncyclic glycols. For these the number of mols. of glycol that combine with Me_2CO in a given time ought to be dependent upon the advantageous positions of these groups with respect to each other. If the OH groups are situated in the same plane and on the same side of the C atoms the number ought to be larger than in compd's. with more unfavorable configurations and when they are directed 180° apart this number should reach a minimum. This method rests on the same principle as the H_3BO_3 method, and is an important complement to this method in cases in which the glycol is insol. in H_2O . For the 1st detns. monochlorhydrin (**A**), ethylene glycol (**B**) and glycerol (**C**) were used. The H_3BO_3 method had shown that of these only glycerol increases the cond. of H_3BO_3 . Detns. of equil. consts. for the reaction: glycol + acetone \rightleftharpoons dioxomethylene deriv. + H_2O , gave 0.14 for **B**, 0.28 for **A** and 0.77 for **C**, at 18°, when no solvent was used. The results show that the OH groups in **C** are closest together, which confirms the previous results with H_3BO_3 . The results show that the OH groups in **A** are a little more favorably situated than in **B**. A disadvantage of this method is that it is not applicable to derivs. of C_4H_8 . The



and Pfähler, *C. A.* **15**, 686), was obtained from Me_2CO (1% H_2SO_4) + **B** as a liquid, d_4^{17} 0.947, b_{76}^{17} 92.5°, n_D^{17} 1.40024. The analogous compds. of **A** and **C** were also obtained (cf. also F. and P., *l. c.*). The various mixts. were placed in small flasks and after the addition of a drop of concd. H_2SO_4 were placed for 12 hrs. in a thermostat. A portion was then transferred into dil. KOH, in which the complex is quite stable, and the Me_2CO detd. by I_2 titration. As a check another portion was acidified to decom. the complex and the entire amt. of Me_2CO present detd.

E. J. WITZEMANN

1,2-Cycloheptanediois and the flexibility of saturated rings. J. BÖSEKEN AND H. G. DERX. Delft. *Rec. trav. chim.* **40**, 529-32 (1921).—The negative influence exercised by the 2 cyclohexanic diols upon the cond. of H_2BO_3 was attributed by B. and Van Giffen, (*C. A.* **14**, 2472) to a certain flexibility of the cyclohexane ring. This flexibility ought to be greater in the cycloheptane ring and B. and D. have prep'd. the unknown 1,2-cycloheptanediois in order to det. this. Their prep'n. is described here. Seven steps are required in their prep'n. (1) 55-60% yields of suberone (**A**) were obtained by distg. Zn suberate *in vacuo* at about 400°. (2) **A** was reduced to suberol (**B**) with $\text{Na} + \text{abs. EtOH}$, giving an 87% yield (Willstätter, *Ann.* **317**, 218 (1901)). (3) **B** was dehydrated by allowing it to fall drop by drop into boiling $\text{C}_6\text{H}_4(\text{CO})_2\text{O}$; the calcd. yield of suberene (**C**), m. 46°, was obtained. (4) **C** was oxidized to give cycloheptanediol (**D**), m. 46°, with KMnO_4 in the presence of MgSO_4 (Straus and Rohrbacher, *C. A.* **15**, 1896); yield 25%. (5) **C** oxidized with peroxybenzoic acid in CHCl_3 soln. (Prilezhaev, *C. A.* **4**, 916) gave an internal oxide (**E**) of cycloheptane in the calcd. amt., oil, b. 161°, $d_4^{18.6}$ 0.9705, $n_D^{18.6}$ 1.46499. (6) **E** boiled with excess 0.1 $N \text{HCl}$ slowly disappeared. The diol sepd. from the CHCl_3 ext., b. 249°, and crysts. as hexagonal plates from PhMe , m. 63°. Of these **D** in accordance with previous experience is the *cis*-diol and **F** is the *trans*-isomer. Both **D** and **F** form Me_2CO complexes (cf. 2 preceding abstrs.) which were isolated in the usual way: that of **D** b. 199° and that of **F** b. 197°. The formation of Me_2CO complexes by both *cis*- and *trans*-forms is remarkable and will be discussed in a later paper.

E. J. WITZEMANN

The product of nitration of *p*-dichlorobenzene. A. F. HOLLEMAN, A. J DEN HOLLANDER AND F. E. VAN HAEFTEN. Univ. Amsterdam. *Rec. trav. chim.* **40**, 323-6 (1921).—Jungfleisch in 1868 nitrated *p*-Cl₂C₆H₄ by boiling it with $\text{HNO}_3 + \text{H}_2\text{SO}_4$ and obtained a mixt. of di-NO₂ derivs., the compn. of which is not yet known. All 3 possible isomers are known to be present but opinion varies as to which is the principal product. Recently Nason (*C. A.* **12**, 2551) has said that 1,4,2,5-C₆H₂Cl₂(NO₂)₂ (**A**) is the main product. This seemed improbable to H. *et al.* and they again examd. this nitration product, which was prep'd. according to the directions of d. Hollander (*C. A.* **15**, 65). The product on crystn. from boiling EtOH seps. 1,4,3,5-C₆H₂Cl₂(NO₂)₂ (**B**) at about 35°. The soln. is filtered at this temp. and on concg. and cooling seps. 1,4,5,6-C₆H₂Cl₂(NO₂)₂ (**C**). The residue from **B** and **C** is obtained as a cauliflower-like mass with a variable m. p.; it resists fractional crystn. Further sepn. was obtained thus: 50 g. of the mass dissolved in 1 l. 4 *N* NH₄OH-EtOH for 24 hrs. at room temp. sepd. 20 g. 4,2,6-Cl₂(O₂N)C₆H₂NH₂ (**D**), which was easily converted into **B** by diazotization. NH₄OH and EtOH were distd. out of the filtrate and the residue washed with H₂O to remove NH₄Cl, leaving 17 g. of a yellow mass of impure **A**. After washing in C₆H₆ with H₂SO₄ the cryst. residue was heated under a condenser for 24 hrs. in NH₄OH-EtOH, which gave the corresponding 3,6,2-Cl₂(O₂N)C₆H₂NH₂, m. 119°. Sometimes **A** is obtained only with great difficulty but H. *et al.* could not learn why. 100 g. of such a troublesome residue in 1 l. NH₄OH-EtOH at room temp. 24 hrs. gave **D** and on working

up the filtrate as above gave 34 g. 2,5-Cl₂C₆H₃NO₂ (E), m. 56°, and hardly any A, showing that nitration of the di-NO₂ stage was incomplete. It seemed likely that A is formed in large quantities only by very energetic nitration. 34 g. E + 102 g. HNO₃ (d. 1.52) + 255 g. concd. H₂SO₄ were boiled under a condenser for 2 hrs. and after pouring out on ice etc., as above, sepd. C. By treating the residue from the filtrate with NH₄OH-EtOH at room temp. D was obtained. The residue from this treated as above sepd. considerable amts. of A. H. *et al.* are inclined to think that the yield of this compd. increases with the intensity of the nitration. E. J. WITZEMANN

Supplement to the paper on the three tetrachlorobenzenes. A. F. HOLLEMAN. Univ. Amsterdam. *Rec. trav. chim.* 40, 318-9 (1921); cf. C. A. 15, 1705.—On page 748 in the paper referred to H. showed that NaOMe acting on C₆HCl₄ give 2,3,5,6-Cl₄C₆H-OH (A) mainly and some 2,3,4,5-Cl₄C₆HOH (B). B was present in a liquid with A. By benzoylation a benzoate (C) m. 110° was obtained. In order to show that this is not derived from A the benzoate of A was prepnd. and m. 136°. Blitz reported the m. p. of the benzoate of 2,3,4,6-Cl₄C₆HOH as 115° but H. has repeated its prepn. and obtained the m. p. 108°, but it shows a sharp lowering in the m. p. when mixed with C. This confirms the formula B for the benzoate C. E. J. WITZEMANN

Action of the Grignard reagent on certain tervalent organo-iodo-compounds. HARRY HEPWORTH. Research Lab., Stevenson, N. B. *J. Chem. Soc.* 119, 1244-9 (1921).—5.5 g. PhICl₂, treated with 1.3 g. Mg in Et₂O with I as a catalyst, gave 1.2 g. MgCl₂, 1.1 g. PhI and traces of C₆H₆ and Ph₂. Similarly, 5 g. *p*-MeC₆H₄ICl₂ and 1.25 g. Mg gave 1.3 g. MgCl₂, 1.1 g. PhMe, 1.2 g. *p*-MeC₆H₄I and traces of (MeC₆H₄)₂. The action of 2.5 mols. of EtMgBr upon PhICl₂ gave PhEt and PhI, while with 3.5 mols. EtMgBrPhEt was almost the sole reaction product. The gas given off in the reaction is C₂H₆, while with *p*-MeC₆H₄ICl₂ and EtMgBr, C₂H₁₀ is evolved and *p*-MeC₆H₄Et and *p*-MeC₆H₄I are formed. PhMgBr and PhICl₂ gave Ph₂ and PhI, and MeC₆H₄ICl₂ behaved in the same way. A small amt. of Ph₂ICl and *p*-MeC₆H₄(Ph)ICl was formed in these expts. The reaction with PhIO in suspension in Et₂O and C₂H₆ is very slow. EtMgBr gave PhI only, while PhMgBr gave PhI and a little Ph₂IOH, isolated as the iodide. Similar results were obtained with *p*-MeC₆H₄IO. PhIO₂ reacts readily with RMgX, but the latter act as reducing agents and the original I compd. is regenerated. Thus *p*-MeC₆H₄IO₂ and EtMgBr give *p*-MeC₆H₄I. PhMgBr and PhIO₂ gave Ph₂ and PhI. In view of the fact that the Cl atoms in the iododichlorides are ionizable and readily removed, it is suggested that the formula (RI). . . . Cl₂ represents their behavior better than the older formula. C. J. WEST

An attempt at nitration of methylenedi-*p*-phenetidine. FRÉDÉRIC REVERDIN. Univ. Geneva. *Helvetica Chim. Acta* 4, 580-8 (1921).—An application of work on the nitration of *p*-phenetidine (A) derivs. (Reverdin and Fürstenberg, C. A. 7, 3314) to methylenedi-*p*-phenetidine (B), prepnd. by Bischoff's method (*Ber.* 31, 3245 (1898)). B added slowly to HNO₃ (d. 1.52) at -10° causes a violent reaction, formation of a reddish brown soln. and decomprn. of B. 60%, 45% and 35% HNO₃ was tried, the best results being obtained with 45%. 5 g. of B added to 15 cc. of 45% HNO₃, let stand 24 hrs., decanted, dild., let stand 1-2 days until white, washed, air-dried and crystd. from EtOH, did not yield a nitrate of B, but the nitrate of a *new base* (C) not yet identified (analysis 60.80, 61.02% C; 6.71, 6.49% H; 11.18, 11.45% N), white prismatic needles, m. 159°, sol. in hot H₂O, HOAc and EtOH, insol. in C₆H₆ and Me₂CO. Dissolved in EtOH, made alk. with Na₂CO₃, dild. to twice its vol., heated and cooled, it yields an unidentified *free base* (D), white prisms, m. 132°, sol. in dil. mineral acids, HOAc, Et₂O, EtOH, insol. in H₂O, and not diazotizable; *nitroso derivative*, from C in HOAc and NaNO₂ at room temp., crystd. from EtOH or HOAc, light yellow crystals, m. 217°, sparingly sol. in EtOH, sol. in HOAc with the reactions of nitrosoamines. The

analysis shows 2 NO groups; *acetyl derivative*, from D and Ac₂O and a little concd. H₂SO₄, boiled 1 min., kept 1 hr. at 100° and crystd. from EtOH, white prismatic needles, m. 237°, sol. in EtOH, C₆H₆, HOAc, sparingly sol. in Et₂O, insol. in petr. ether. Analysis shows 2 Ac groups. The reaction of CH₃O and A has been in dispute (*Chem. Ztg.* 22, 395(1897); 24, 97(1900); 25, 178(1901); *Ber.* 27, 2411(1894); *C. A.* 12, 366, 367, 558. It is shown that several bases are formed besides those previously described (*loc. cit.*) which are yet to be identified. Following Goldschmidt's procedure R. obtained a compd. from EtOH, m. 140° (G., 139°). The mother liquor washed with Et₂O, crystd. from petr. ether, yields a base (E), white prisms, m. 107°, sol. in dil. EtOH, petr. ether, insol. in Et₂O, and not diazotizable. Its *hydrochloride*, from H₂O, white, closely packed needles. E in EtOH yields a small amt. of a base, small closely packed needles, m. 200°, sparingly sol. in EtOH. 10 cc. of 33% CH₃O added to 5 g. of B in 45 cc. of 45% HNO₃, let stand 4 days, yields C and a new base, m. 132°. Goldschmidt's base (*Chem. Ztg.* 24, 97(1900); 25, 178(1901)) could not be nitrated, and was insol. in 45% HNO₃ at room temp., and partially sol. at 50°. Pptn. of the sol. portion by Na₂CO₃ gave a non-cryst. resinous product.

C. C. DAVIS

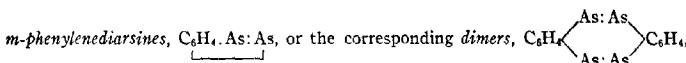
Influence of substituents on reactions. VI. The nitration of substituted acetanilides. HARTWIG FRANZEN AND ERWIN ENGEL. Tech. Hochschule. Karlsruhe. *J. prakt. Chem.* 102, 156-86(1921); cf. *C. A.* 13, 1308-10; 15, 836.—PhNHCOMe (A), *o*-MeC₆H₄NHAc (B), *o*-ClC₆H₄NHAc (C), *o*-BrC₆H₄NHAc (D), *o*-EtC₆H₄NHAc (E) and *m*-ClC₆H₄NHAc (F) were nitrated by 2 methods to det. the influence of certain substituents. In method I the particular acetanilide was mixed with fuming HNO₃ and HOAc at 0°, let stand 0.5-1.0 day and poured into H₂O. Method II was that of Witt and Utermann (*Ber.* 39, 3901(1906)). By method I the yields in % of *o*-, *m*-, and *p*-NO₂ derivs. were: from A, *o* 30, *p* 70; B, *o* 60, *p* 40; C, *o* 62, *p* 38; D, *o* 52, *p* 48; E, *m* 31, *p* 40; F, *o* 42, *p* 58. By addition of NH₄NO₃ (G) divergent results were obtained, i. e., with A the yield of *o*-NO₂ compd. is increased, whereas with B it is decreased. No explanation of this is offered. By method II the yields were: from A, *o* 62, *p* 38; B, *o* 65, *p* 35; E, *m* 31, *p* 69. It was found in general that (1) by the introduction of Me, Cl or Br in the 2-position and of Cl in the 3-position of A, the activity of the 6-H atom with HNO₃ is increased and that of the 4-H atom reduced (the influence of Br is less than that of Me or Cl, which have approx. the same influence); (2) by introduction of —OEt in the 2-position the activity of the 6-H atom is so far reduced that no *o*-NO₂ compd. is formed, and the activity of the 4-H atom is lessened, but that of the 3-H atom considerably increased; (3) by addition of G to the nitration mixt. the relative yields of isomers are changed, and (4) the yields of isomers show that the —NHAc group has greater directing influence in substitutions in the Witt-Utermann nitration than in nitration by method I.

C. C. DAVIS

The Witt-Utermann method for the separation of *o*- and *p*-nitroacetanilide. HARTWIG FRANZEN AND FRITZ HELWERT. Tech. Hochschule. Karlsruhe. *J. prakt. Chem.* 102, 187-93(1921).—The sepn. of *o*- and *p*-O₂NC₆H₄NHAc (A and B) by the method of Witt and Utermann (*Ber.* 39, 3903(1906)) was applied to the sepn. of derivs. of A and nitroacetophthalides. It was found that *m*-O₂NC₆H₄NHAc (C) could be sepd. from A and that in general the B deriv. could be sepd. from the A deriv. unless the A deriv. were halogenated. 1,2- and 1,4-C₁₀H₈(NHAc)NO₂ could not be sepd., but 1,2-C₁₀H₈(NO₂)NHAc could be sepd. from the other 2-acetylaminonitronaphthalenes. KOH could be replaced by NaOH without modifying the results, but not by NH₄OH. The solv. of numerous compds. in the Witt-Utermann reagent was detd. at 0°. The data show the no. of cc. for 1 g.: A 20; B 333; C 667; 3,2-Me(AcNH)C₆H₄NO₂ (D) 40; 4,3-isomer 500; 5,4-isomer 533; 5,2-isomer 83; 6,3-isomer 1660; 3,2-Cl(AcNH)C₆H₄NO₂ 6; 3,2-Br(AcNH)C₆H₄NO₂ 8; 1,2-C₁₀H₈(NO₂)NHAc (E) 52; 1,2-C₁₀H₈(NHAc)-

NO_2 150; $1,4\text{-C}_6\text{H}_4(\text{NHAc})\text{NO}_2$ 312. Replacing KOH by NaOH the solv. of A was 20; D 80. Replacing KOH by NH_4OH , A was insol., E 60.6. C. C. DAVIS

Aromatic diarsinic acids and their reduction products. I. HANS LIEB. Univ. Graz. *Ber.* 54B, 1511-9(1921).—Atoxyl (10 g.) in 400 cc. H_2O and 26.1 cc. 5 N H_2SO_4 at 8° is diazotized with 2.2 g. NaNO_2 , cooled to 0°, treated with 15.7 cc. 5 N NaOH, then, with vigorous stirring, with 17 cc. of Na_3AsO_3 soln. (198 g. As_2O_3 in 800 cc. 5 N NaOH made up to 1000 cc.) previously treated with 1.5 cc. of 5 N H_2SO_4 (cf. Schmidt, *C. A.* 15, 504); the soln., which is just still faintly alk., suddenly evolves N violently and after standing some time at room temp. is heated to 50-60°, cooled, distinctly acidified with HCl, filtered from the ppt. (which has not yet been investigated), evapd., extd. several times with boiling alc. and concd.; the *p*-phenylenediarsinic acid (A) soon begins to cryst. and seps. from H_2O in needle-like leaflets (yield, 1.5 g. from 5 g. atoxyl); *trisodium salt*, needles with 14 H_2O from a faintly alk. soda soln. of the acid with an excess of alc. On the other hand, when 3 g. $m\text{-H}_2\text{NC}_6\text{H}_4\text{AsO}_3\text{H}_2$ in 150 cc. H_2O and 8.9 cc. 5 N H_2SO_4 at 6° is diazotized with 1.2 g. NaNO_2 , cooled to 3°, treated with only 2.4 cc. 5 N NaOH so that the soln. is still distinctly acid, and quickly treated at 0° with 8.5 cc. Na_3AsO_3 (containing 0.6 cc. 5 N H_2SO_4), the evolution of gas is only very faint but increases on slowly heating to room temp.; the soln. is finally heated to 40-50°, allowed to stand a long time, acidified with HCl, filtered, boiled with charcoal and concd. to 1/3 its vol.; on standing there seps. *azobenzene-m,m'-diarsinic acid*, long dark orange-yellow needles, evolves gas slightly at 240°, darkens on higher heating, purified through the *tri*- (or *tetra*) *sodium salt*, orange-yellow needles with 11 H_2O . If, however, 5 g. of the $m\text{-H}_2\text{NC}_6\text{H}_4\text{AsO}_3\text{H}_2$ in 15 cc. 5 N H_2SO_4 and 250 cc. H_2O is diazotized at 7-8° with 2 g. NaNO_2 , cooled to 3°, neutralized with 15 cc. 5 N NaOH, cooled to 0° and treated with 14 cc. of Na_3AsO_3 , there is at once a vigorous evolution of N and on treating the product as described for A, *m*-phenylenediarsinic acid (B) is obtained in leaflets from H_2O , deflagrates on heating; *trisodium salt*, needles with 10 H_2O . For the reduction, 0.3 g. of the diarsinic acid in H_2O containing a few drops of soda and 0.6-0.7 g. H_3PO_4 in a hard-glass tube is heated 2-3 hrs. (at 210-20° in the case of A, 235° in that of B) and the amorphous product is washed with much H_2O , best in the centrifuge, then with alc., spread on clay, dried *in vacuo* over H_2SO_4 , and again treated with dil. HCl, NaOH and H_2O . The products are yellow amorphous powders, decomp. at high temps. without melting, are insol. in the usual org. solvents, oxidized back to the diarsinic acids by hot dil. or cold concd. HNO_3 and by H_2O_2 . Whether they are the monomeric *p*- and



could not be detd., as no mol. wt. detns. could be made on account of their insol.

CHAS. A. ROUILLER

Sulfonation of toluene with chlorosulfonic acid. LEONARD HARDING. Univ. Cambridge. *J. Chem. Soc.* 119, 1261-6(1921).—This study was made to obtain further information on the mechanism of the reaction and details as to the max. yield of the *o*-isomer. The compn. was detd. by reference to the m. p. curve (*C. A.* 13, 1279). The action of ClSO_3H upon C_6H_5 at low temps. (-35 to -40°) gave a very small yield of a mixt. contg. 53-8% *p*-isomer. If the mixt. is made at -40° and then allowed to warm to 5-10°, the yield is increased, while the % of *p*-isomer is about 52. As the temp. rises, the % of *p*-isomer increases (-15°, 57.5; 5-10°, 73; 20-25°, 76.5; 35-40°, 86; 75-80°, 94.5). When these facts are considered in connection with the further fact that with 1 mol. ClSO_3H the main product is the acid, but with an excess ClSO_3H the main product is the chloride, it appears that the reaction takes place in 2 steps, and that it is essential in obtaining good yields of chloride to allow the mixt. to stand a sufficient

length of time to complete the 2nd reaction. This is important since incomplete investigations show that the acids are not proportionately converted into the acid chlorides in dil. solns. of ClSO_3H , but that the predominating acid is more quickly transformed. Any local excess of C_2H_8 should be avoided if the *o*-isomer is required in max. yield. This is met by spraying the C_2H_8 into the acid. There is an early limit to the effect of temp. on the yield of *o*-isomer, as seen in the fact that the yield is lower at -40° than at $5-10^\circ$.

C. J. WEST

Thermal decomposition of phenoxides. FRANZ FISCHER AND UDO EHRENDART. *Ges. Abhandl. Kenntnis. Kohle* 4, 237-62 (1919).—K and Na phenoxides behave exceptionally in that when dry they give only gaseous products, H_2 and a little CH_4 ; they decom. at $450-500^\circ$. PhONa , when heated in a current of CO_2 , gives H_2 and CO as well as liquid products. Decompr. in a stream of CO gives CH_4 , small quantities of phenol, and C_6H_6 . Fusion of NaOPh with HCO_2Na at red heat gives a red liquid distillate as well as C_2H_6 . Fusion of NaOPh with NaOH and C gives only traces of phenol. *Lithium phenoxide* decomps. 450° , giving liquid products as well as H_2 , CH_4 , CO , and CO_2 . *Normal calcium phenoxide* gives principally phenol. *Basic calcium phenoxide*, HO.Ca.OPh , decomps. 450° , giving liquid products as well as H_2 , CH_4 , and CO . Decompr. in a stream of CO_2 gives complete decompr. into CaCO_3 and phenol. *Barium phenoxide* decomps. 600° , giving a small amt. of liquid products with H_2 , CH_4 , and CO . *Aluminum phenoxide* decomps. below a red heat, giving liquid products (C_6H_6 , phenol, Ph_2O , methyl diphenylene oxide, and pyrocresol) as well as H_2 and CH_4 . Phenoxides of Mg, Zn, and Fe could not be prep'd. *Basic copper phenoxide*, HO.Cu.OPh , prep'd. from CuSO_4 and KOPh , gave no noteworthy decompr. products. It was shown that phenol with concd. NH_3 in the presence of Cu is oxidized by air, giving a deep black soln. which becomes viscous on evapn., solidifying to a varnish-like product. *Basic nickel phenoxide*, HO.Ni.OPh , decomps. below a red heat, giving a small quantity of liquid product as well as CO_2 , CO , H_2 , and CH_4 . *Basic lead phenoxide*, HO.Pb.OPh , decomps. below a red heat giving liquid products (phenol, diphenylene oxide, and a reddish brown oil) and CO_2 . Heated somewhat above 100° , it fuses and solidifies to a glassy substance on cooling. *Sodium p-tolyl oxide*, prep'd. by the action of Na or NaOH on *p*-cresol, decomps. between 450° and 600° . More CH_4 is formed than in the case of the phenoxide, and large quantities of liquid products are obtained, consisting chiefly of cresol. *Sodium m-tolyl oxide* decomps. in a similar manner. *Potassium p-tolyl oxide* decomps. between 420° and 550° similarly to NaOPh . *Basic calcium p-tolyl oxide*, $\text{HO.Ca.OC}_6\text{H}_4\text{H}_2$, gives, on dry distn., mainly cresol. J. C. S.

Organic derivatives of thallium. II. Interaction of thallium dialkyl hydroxide with nitrophenols and nitrocresols. ARCHIBALD EDWIN GODDARD. Univ. Birmingham. *J. Chem. Soc.* 119, 1310-5 (1921); cf. *C. A.* 15, 2416.—G. has continued his study on the comparison of the color of nitrophenoxides. The hydroxide was obtained by the action of moist Ag_2O on the halide. The calcd. amt. of $\text{O}_2\text{NC}_6\text{H}_4\text{OH}$ was then added and the phenoxide crystd. out. The colors of the salts thus obtained resemble very closely those for the alk.-eartn' nitrophenoxides. It is again noticeable that the color gradient between *m*- and *p*-compds. is much greater than between *o*- and *m*-compds. All di-Me compds. have a more intense color than the corresponding di-Et compds. *Thallium dimethyl derivatives*: *o*-*Nitrophenoxide*, $\text{C}_8\text{H}_{10}\text{O}_3\text{NTl}$, from the hydroxide from 2 g. Me_2TiI in 50 cc. H_2O and 0.77 g. *o*- $\text{O}_2\text{NC}_6\text{H}_4\text{OH}$, brick-red needles, m. 237° . *m*-*Nitrophenoxide*, obtained as brilliant red cubes containing $\text{C}_8\text{H}_{10}\text{O}_3\text{N}$, m. 150° , or yellowish orange plates, m. 202° . The lower- is easily transformed into the higher-melting form by washing with Et_2O or EtOH . *p*-*Nitrophenoxide*, yellow plates, darkens at 273° and explodes violently at 275° . *4,6-Dinitro-2-aminophenoxide*, $\text{C}_{10}\text{H}_4\text{O}_5\text{N}_2\text{Ti}$, small, deep reddish violet plates, m. 236° (decompn.). *3-Nitro-*o*-tolyloxide*, $\text{C}_8\text{H}_{10}\text{O}_2\text{NTl}$, deep red cryst.

plates, m. 186.5°. All its solns. are red. *Thallium diethyl derivatives*: *o-Nitrophenoxide*, $C_{10}H_{12}O_3NTl$, brilliant scarlet plates, m. 210° (decompn.). *m-Nitrophenoxide*, brownish orange, oblong plates, m. 196°. *p-Nitrophenoxide*, lemon-yellow, rhomboidal plates, m. 238°. *2,4-Dinitrophenoxide*, $C_{10}H_{12}O_3N_2Tl$, brownish orange plates, m. 174°. *4,6-Dinitro-2-aminophenoxide*, $C_{10}H_{12}O_3N_2Tl$, small, carmine-red plates with a metallic luster, m. 159° (decompn.), explodes violently when moistened with fuming HNO_3 . *2,4,6-Trinitrophenoxide*, $C_{10}H_{12}O_3N_3Tl$, golden yellow, oblong plates, m. 204° (decompn.). *3-Nitro-o-tolyloxide*, $C_{11}H_{14}O_3NTl$, deep red plates with a green reflex, m. 190-1°. *4-Nitro-m-tolyloxide*, pale red plates, explodes violently at 228°. *3-Nitro-p-tolyloxide*, small, ruby-red rhomboidal plates with a green luster, m. 206°. *6-Nitro-m-tolyloxide*, small, lemon-yellow plates, m. 216.5° (decompn.). *5-Nitro-o-tolyloxide*, $C_{11}H_{14}O_3NTl$, $C_7H_7O_3N$, brownish yellow plates, m. 181.5°. The solv. of these compds. decreases from *o*- to *p*-derivs. in both series. This applies also to the tolyloxides, those having HO and NO_2 groups in *o*-positions being less sol. than the compds. in which the same groups are in the *m*- and *p*-positions.

C. J. WEST

The replacement of substituents in the benzene ring. VI. The trichlorodinitrobenzenes; their reaction with sodium methylate and with ammonia. E. J. E. HÜFFER S. J. Univ. Amsterdam. *Rec. trav. chim.* 40, 451-76 (1921).—*Prepn. of 6 trichlorodinitrobenzenes*.—1,3,5,2,6- $Cl_3C_6H_2(NO_2)_2$ (A) was obtained by nitrating *sym*- $C_6H_3Cl_3$ (Jackson, *Am. Chem. J.* 9, 348). The 1,2,3,4,5-trichlorodinitrobenzene (B) was obtained by heating 1 part 1,2,3,5- $Cl_3C_6H_2NO_2$ (Holleman, *C. A.* 13, 569) with 5 parts HNO_3 (d. 1.52)+5 parts concd. H_2SO_4 on the H_2O bath 1 hr.; large yellow crystals from $EtOH$, m. 105-6°. 1,2,3,4,6-Trichlorodinitrobenzene (C) was obtained, by nitrating *vic*- $Cl_3C_6H_3$ in the above mixt., as green-yellow needles, m. 92-3°. The 1,2,4,3,5-isomer (D) was obtained in quant. yield from *asym*- $Cl_3C_6H_3$ (Jungfleisch, *Ann. chim. phys.* [4] 15, 275 (1869)). 1,2,4,5,6-Trichlorodinitrobenzene (E) was obtained by 3 methods which are described and of which only the 3rd, consisting in the nitration of 2,3,5- $Cl_3C_6H_2NO_2$ in the acid mixt. used above, gave good yields. After 2 hrs. on the H_2O bath and pouring into H_2O E was sepd.; light yellow prisms, m. 70-1°. 1,2,4,3,6-Trichlorodinitrobenzene (F) was prep'd. in 3 ways. The 2nd method required 5 steps as follows: 1,2,4,3- $Cl_3C_6H_2NO_2$ (*C. A.* 15, 1707) reduced with Fe powder and HCl at 70° gave 2,3,6-trichloroaniline, m. 63-4°, which with Ac_2O gave the corresponding *acetanilide*, m. 172-3°, which on nitrating in the above acid mixt. gave 2,3,6,5-trichloronitroacetanilide, m. 218-9°, from which the Ac group was removed in the usual way, giving the corresponding *aniline* (G), m. 111-2°; in this the NH_2 group was replaced by den Hollander's method (*C. A.* 15, 65) to give F, m. 102.5-103.5°. In the 3rd method 20.6 g. 2,5,4-dichloronitroaniline were divided in 200 cc. HCl (d. 1.19) and 4.6 g. $KClO_3$ added gradually with agitation, keeping the temp. below 10°. The reaction mixt. dild. with 1 l. H_2O sepd. 2,5,6,4-trichloronitroaniline, m. 145.5-6.5°, which on diazotization as with G gave F in 2 modifications (a nearly white amorphous form and yellow cryst. needles). The action of trichlorodinitrobenzenes with $MeO Na$ and NH_3 .—The dichlorodinitroanisoles and the trichloronitroanisoles that may be formed by the action of $NaOMe$ on the above 6 isomers are all unknown. In order to det. the constitution of these it would have been necessary to prep. them all synthetically from anisoles of known structure. This long way would not give unquestionable results. H. decided to use the action of NH_3 on the isomers depending on the rule, so far without exception, that NH_2 and OMe replace the same atom or group in aromatic compds. The structure of these anilines is easily detd. If a Cl atom is replaced by NH_2 , the aniline obtained ought to give a $Cl_3C_6H_2(NO_2)_2$, all of which are known, by the elimination of the NH_2 group. If a NO_2 group is replaced by NH_2 and the latter replaced with Cl by diazotization a $Cl_3C_6HNO_3$ is formed, all of which are known. On the basis of existing knowledge it

can be predicted whether Cl or NO_2 will be replaced. The replacement of NO_2 groups always takes place when they are *p*- or *o*- to each other. In the substitution of Cl a certain amt. of the isomer was put in a sealed tube with an equiv. amt. of $\text{NH}_3\text{-EtOH}$ and heated a day at 100° . If NO_2 is substituted NH_4NO_2 is formed, which decomps. into $\text{N}_2 + \text{H}_2\text{O}$, causing strong pressure and so the reaction was carried out in a stoppered flask from which the gas was liberated from time to time. The reactions with NaOMe are rapid at ordinary temp. The product was sepd. by pouring the reaction mixt. on ice. The filtrate was tested with AgNO_3 and $\text{H}_2\text{SO}_4\text{-FeSO}_4$ for chlorides and nitrite, resp. A with $\text{NH}_3\text{-EtOH}$ showed hardly any NH_4NO_2 , but much Cl in the filtrate, and gave what is probably *chloro-2,6-dinitrophenylene-3,5-diamine* although it was not completely diazotized to give *2,6-(O₂N)₂C₆H₃Cl*. A with MeONa gave *3,5-dichloro-2,4-dinitroanisole*, light yellow needles, m. $148.5-9.5^\circ$. B with NH_3 gave *2,3,4-trichloro-6-nitroaniline*, m. $138-9^\circ$. B with NaOMe gave *2,3,4-trichloro-6-nitroanisole* as yellow needles, m. 83° . C with NH_3 gave *2,3-dichloro-4,6-dinitroaniline*, yellow needles, m. $197-8^\circ$. C with NaOMe gave *2,3-dichloro-4,6-dinitroanisole*, white spangles, m. $69-70^\circ$. D with NH_3 gave probably *chloro-3,5-dinitrophenylene-2,4-diamine* as orange needles, m. $244-5^\circ$, by the replacement of 2 Cl atoms. D with NaOMe gave yellow rhomboidal plates, m. 57° , and an oil which is probably a mixt. of *2,5-dichloro-4,6-dinitroanisole*, (H) and *3,4-dichloro-2,6-dinitroanisole*. H was identified with the crystals that m. 57° . E with NH_3 gave *2,3,5-trichloro-6-nitroaniline* as orange needles, m. $100-1^\circ$, and is the only case observed in which a NO_2 group is substituted which is *m*- to 2 Cl atoms. E with NaOMe gave 2 products of which *2,3,5-trichloro-6-nitroaniline* is formed in largest amt., m. 55° . The other product, m. $138-40^\circ$, was obtained by substitution of a Cl atom but its constitution is unknown at present. F with NH_3 gave *2,3,6-trichloro-4-nitroaniline*, m. $145-6.5^\circ$. F with NaOMe gave *2,3,6-trichloro-4-nitroanisole* as white silky needles, m. 67.5° . *Velocity of reaction of the trichlorodinitrobenzenes with NaOMe*. The velocity of reaction was detd. at 0° in the app. described by Ter Weel (C. A. 10, 1511). 3.4922 g. of the isomer in a 250-cc. flask was dissolved in 200 cc. MeOH. After cooling in ice 25 cc. 0.5012 N MeONa were added and the flask was filled to the mark. The course of the reaction was followed by titrating the free alkali with AcOH . The data are given in tables and the av. results for K_0 and $(K_0 \times 1000)/1.20$ are for A, 0.0605, 50.4; for B 2.35, 1960; C 3.58, 2980; D 0.323, 269, E 0.675, 563; F 0.799, 660, resp. In these results the 2 reactions with D and E are calcd. as one. The qual. conclusions follow: (1) While lower chloronitro compds. give place only exceptionally to 2 simultaneous reactions 2 of the above 6 isomers show this effect. (2) Although in general $\text{NH}_3\text{-EtOH}$ and MeONa give parallel results in these 2 cases (D and E) the former attacks 2 groups while the latter attacks but one; (3) d. Hollander (C. A. 15, 65) formulated 5 qual. rules for various chloronitro derivs. of C_6H_6 , of which all were here confirmed except nos. 4 and 5 for E where a NO_2 group *m*- to 2 Cl atoms is replaced. For the quant. conclusions giving comparative data for the various series of chloronitro derivs. of C_6H_6 that have been investigated see the original. E. J. WITZEMANN

The production of picric acid from grass tree gum. W. R. JEWELL. *Chem. Eng. Mining Rev.* 13, 322-4 (1921).—Practical methods for oxidizing and nitrating the gum and for sepg. and purifying the picric acid are described. The yield of picric acid from the gums of 4 species varied from 19 to 35%. The highest was from the yellow gum from *Xanthorrhoea hastilis*. It is doubtful if, under present conditions, this source of picric acid could compete with others. T. G. PHILLIPS

Influence of substitution in the components upon the equilibrium of binary solutions. XXIX. The binary system of *m*-aminophenol with amines. ROBERT KREIMANN AND HEINZ HOHL. Univ. Graz. *Monatsh.* 41, 613-30 (1921); cf. C. A. 15, 2636.—*m*- $\text{H}_2\text{NC}_6\text{H}_4\text{OH}$ and *p*- $\text{MeC}_6\text{H}_4\text{NH}_2$ form an eutectic at 37° and 13% *m*- $\text{NH}_2\text{C}_6\text{H}_4\text{OH}$;

there is a 2nd break in the curve at 50° and 35% $\text{NH}_2\text{C}_6\text{H}_4\text{OH}$, after which the curve is smooth. In the case of PhNH_2 , the eutectic is at -16° and 85% PhNH_2 . $\alpha\text{-C}_{10}\text{H}_7\text{NH}_2$ gives a simple eutectic at 36° and 84% $\alpha\text{-C}_{10}\text{H}_7\text{NH}_2$. With $\beta\text{-C}_{10}\text{H}_7\text{NH}_2$ an equimol. compd. is formed, which forms an eutectic with $m\text{-NH}_2\text{C}_6\text{H}_4\text{OH}$ at 91.5° and 51% $\beta\text{-C}_{10}\text{H}_7\text{NH}_2$, and with $\beta\text{-C}_6\text{H}_4\text{NH}_2$ at 90° and 71% $\beta\text{-C}_{10}\text{H}_7\text{NH}_2$. The eutectic with $o\text{-C}_6\text{H}_4(\text{NH}_2)_2$ is at 63° and 55% $o\text{-C}_6\text{H}_4(\text{NH}_2)_2$ and with the *m*-diamine at 24° and 63% $m\text{-C}_6\text{H}_4(\text{NH}_2)_2$. The *p*-diamine forms 2 compds., 2 $m\text{-NH}_2\text{C}_6\text{H}_4\text{OH}$ and 1 $p\text{-C}_6\text{H}_4(\text{NH}_2)_2$, and 1 mol. each. The eutectic of the 1st with $m\text{-NH}_2\text{C}_6\text{H}_4\text{OH}$ is at 94° and 23% $p\text{-C}_6\text{H}_4(\text{NH}_2)_2$. The eutectic between the 2 compds. is at 95° and 38% $p\text{-C}_6\text{H}_4(\text{NH}_2)_2$, while the 2nd compd. and $p\text{-C}_6\text{H}_4(\text{NH}_2)_2$ form an eutectic at 101° and 56% $p\text{-C}_6\text{H}_4(\text{NH}_2)_2$. With *p*- $\text{NH}_2\text{C}_6\text{H}_4\text{OH}$ and *p*- $\text{MeC}_6\text{H}_4\text{NH}_2$, there is an eutectic at 41° and 95% *p*- $\text{MeC}_6\text{H}_4\text{NH}_2$. **XXX.** The binary systems of diphenylmethane with phenols and amines. ROBERT KREMMANN AND JULIUS FRITSCH. *Ibid.* 631-53.—The following eutectic points are illustrated by curves constructed from tables showing the temp. of primary crystn. Ph_2CH_2 with $\alpha\text{-C}_{10}\text{H}_7\text{NH}_2$, 9.5° and 63% Ph_2CH_2 ; $\beta\text{-C}_{10}\text{H}_7\text{NH}_2$, 21.4° and 95% Ph_2CH_2 ; $p\text{-C}_6\text{H}_4(\text{NH}_2)_2$, 23.3° and 99% Ph_2CH_2 ; $\alpha\text{-C}_{10}\text{H}_7\text{OH}$, 19.6° and 92.5% Ph_2CH_2 ; $\beta\text{-C}_{10}\text{H}_7\text{OH}$, 22.6° and 95% Ph_2CH_2 ; 1,2- $\text{C}_6\text{H}_4(\text{OH})_2$, 23.1° and 99% Ph_2CH_2 ; 1,4- $\text{C}_6\text{H}_4(\text{OH})_2$, 23.9° and 100% Ph_2CH_2 . The systems with 1,3- $\text{C}_6\text{H}_4(\text{OH})_2$ and with 1,2,3- $\text{C}_6\text{H}_3(\text{OH})_3$ differ from the above in that there is a region where two liquid phases exist. In the case of 1,3- $\text{C}_6\text{H}_4(\text{OH})_2$ this is at 102° and between 27 and 84% Ph_2CH_2 . The critical soln. point for the 2 liquid layers is at 115.4°. With 1,2,3- $\text{C}_6\text{H}_3(\text{OH})_3$ the values are 115°, 10 to 92% Ph_2CH_2 , while the critical soln. point is about 123°. With *m*- $\text{NO}_2\text{C}_6\text{H}_4\text{OH}$ the eutectic is at 22° and 97% Ph_2CH_2 , with *p*- $\text{NO}_2\text{C}_6\text{H}_4\text{OH}$ 23° and 100% Ph_2CH_2 , with picric acid at 22.5° and 93% Ph_2CH_2 .

C. J. West

Thiophenols. IV. Thiophenol ethers of triphenylmethane and the auxochromic action of the alkylmercapto groups (preliminary communication). K. BRAND AND OTTO STALLMANN. Univ. Giessen. *Ber.* 54B, 1578-85 (1921); cf. *C. A.* 7, 1722.—Salts of azothiophenol ethers (e. g. (2- or 4-MeSC₆H₄N=)₂) are deep blue in soln. while the corresponding salts of the azophenol ethers under the same conditions are only red, *i. e.*, replacement of the O by S has a bathochromic effect. It has now been found that the MeS group likewise deepens the color of the halochromic compds. of Ph₃COH much more than the MeO group, and, in accordance with the general rule (Kaufmann, *C. A.* 6, 1528), the auxochromic effect is greater in the *o*- than in the *p*-position to the central C atom. *o*-O₂NC₆H₄SMe₂OSO₃Me (A) is colorless, both in the solid state and in aq. soln., while *o*-O₂NC₆H₄SMe (B) is deep yellow and forms yellow solns., so that the MeS group in passing from bi- to quadrivalent S loses its auxochromic properties, just as the NH₂ group, on forming a salt, ceases to be an auxochrome. B dissolves somewhat in hot H₂O with yellow color and seps. on cooling in fine yellow needles, m. 64-5°; 10 g. heated on the H₂O bath with an excess of Me₂SO₄ until a sample dissolves clear in cold H₂O without sepn. of B (1-2 days), freed from the excess of Me₂SO₄ by repeated evapn. with MeOH and taken up in 20 cc. alc. gives *o*-nitrophenyldimethylsulfonium methyl sulfate (A), stout crystals, m. 155-7° (decompn.), becomes yellowish on long standing in the air, probably with formation of B; *iodide*, O₂NC₆H₄SMe₂I, from A in a little H₂O and somewhat more than the calcd. amt. of solid KI, yellow needles, quickly decompns. in the air, in a desiccator or in sealed tubes, gradually liquefying and then resolidifying, m. (fresh) 79-81° (decompn.). *o*-H₂NC₆H₄SMe, b₁₅ 133-4°, b. 234°, is obtained in 83-5% yield from 50 g. powdered B suspended in a soln. of 5-7 g. CuCl₂ in 200 cc. H₂O treated in the course of 2-3 hrs., with continuous shaking, alternately with 250 cc. concd. HCl and 80 g. Fe powder, taking care that the temp. does not rise to the m. p. of the B, made alk. with NaOH or soda, distd. with steam, extd. with Et₂O

and dried with Na_2SO_4 ; 8 g. in 50 cc. H_2O and 20 g. concd. HCl diazotized with 4.5 g. NaNO_2 in 20 cc. H_2O , gradually poured into a suspension of CuBr_2 (from 25 g. CuSO_4) in 15 g. KBr and a little H_2O at 60–70°, treated with 100 cc. concd. HCl when the evolution of N ceases, distd. with steam, shaken with dil. NaOH , taken up in Et_2O and dried with CaCl_2 , gives 55–65% of *o*-bromophenyl methyl sulfide (C), strongly refractive oil of peculiar odor resembling that of *o*-BrC₆H₄OMe, $b_{75}^{\text{D}} 256^{\circ}$, $d_{18}^{\text{D}} 1.5135$, $n_{\text{D}}^{16} 1.6340$, gradually becomes yellow. The NaOH ext. of the crude C on acidification yields an oil probably containing *o*-HOC₆H₄SMe. In the steam distn. the C is followed by a small amt. of diphenylene disulfide (thianthrene), $m. 158^{\circ}$, a larger amt. of which can be isolated from the residue in the distg. flask by extn. with alc. *o*-Methylmercapto-triphenylcarbinol, broad needles from alc., $m. 95.5\text{--}8.0^{\circ}$, is obtained in 6-g. yield from 1 g. Mg and 8 g. C in 15–20 cc. Et_2O with a particle of I or 1–2 drops *o*-IC₆H₄SMe gradually treated, after the Mg has practically all dissolved (about 2 hrs.), at room temp. with 7 g. Ph_2CO in 20 g. Et_2O , allowed to stand 1 hr., heated on the H_2O bath until the product becomes solid, decompd. with ice and then with dil. H_2SO_4 , freed from the Et_2O and by-products with steam and taken up in Et_2O ; its solns. in alc. or AcOH become intensely yellowish green on addition of concd. H_2SO_4 or HCl . *o,o'*-Dimethylmercapto-triphenylcarbinol (8 g. from 11 g. C and 1.4 g. Mg in 30 cc. Et_2O in ice treated dropwise with 4 g. BzOEt in 20 cc. Et_2O), leaflets from alc., $m. 136^{\circ}$; the AcOH or alc. soln. is colored a deep yellowish green by concd. H_2SO_4 or HCl ; the soln. in concd. H_2SO_4 is likewise yellowish green but soon becomes from brown-red to red. C. A. R.

Tautomerism of resorcinol; in defence against W. Fuchs. J. HERZIG AND S. ZEISEL. *Ber.* 54B, 1403–7 (1921); cf. Fuchs, *C. A.* 15, 2073.—Polemical. C. A. R.

The hydrazide and azide of benzylsulfonic acid. THEODOR CURTIUS AND FRIEDRICH WILHELM HAAS. Univ. Heidelberg. *J. prakt. Chem.* 102, 85–112 (1921).—C. and Lorenzen (*J. prakt. Chem.* 58, 168, 180 (1898)) and Raschig (*C. A.* 4, 2363; 5, 3020) showed that sulfonylhydrazides hydrolyze to the sulfinic acid with ultimate evolution of H and N . $\text{RSO}_2\text{NHNNH}_2 \rightarrow \text{RSO}_2\text{H} + \text{HONHNH}_2$; $\text{HONHNH}_2 \rightarrow \text{NHNH} \rightarrow \text{N}_2 + \text{H}_2$. C. and H. attempted to isolate the unknown NHNH (A) by pptn. of its Ag salt during hydrolysis. 20 g. of $\text{PhCH}_2\text{SO}_2\text{Cl}$ (B) dissolved in the least possible abs. EtOH , added to 11 g. of $\text{N}_2\text{H}_4\text{OH}$ at 0°, filtered, washed with ice H_2O , and crystd. from hot abs. EtOH (the mother liquor also dild., cooled and filtered) yields 16.3 g. of the compound $\text{PhCH}_2\text{SO}_2\text{NHNH}_2$ (C), shining silver white scales, $m. 131\text{--}2^{\circ}$ (decompn.), difficultly sol. in cold H_2O , sol. in EtOH , insol. in Et_2O . It reduces cold $\text{NH}_3\text{-AgNO}_3$. A H_2O soln. on boiling liberates N and H with formation of $\text{PhCH}_2\text{SO}_2\text{H}$. *Hydrochloride*, needles, $m. 148^{\circ}$, sol. in EtOH , insol. in Et_2O , decompd. on heating. Addition of AgNO_3 to a soln. of C boiled until gas is evolved does not yield a salt of A, but a ppt. which turns black, the compound $(\text{PhCH}_2\text{SO}_2\text{NHNH}_2)_2\text{AgNO}_3$, obtained pure from AgNO_3 and C in abs. EtOH , shining silvery leaflets, sol. in H_2O , stable only in the dark. It gives a blue color with Ph_2NH in concd. H_2SO_4 . 10 g. of C in dil. HCl shaken with 6 g. BzH , filtered, washed with Et_2O , crystd. from warm abs. EtOH , yields the compound $\text{PhCH}_2\text{SO}_2\text{NHNH:CHPh}$, white needles, $m. 139.5^{\circ}$ (decompn.). 1.163 g. of C heated 2 days in abs. EtOH liberates 70 cc. of a mixt. of N and H . On evapn. the compound $\text{PhCH}_2\text{SO}_2\text{N}_2\text{H}_2$ (D) seps., needles, decomp. 150°, sol. in cold H_2O . BzH added to D yields benzaldazine, yellow needles from EtOH , $m. 93^{\circ}$. The filtrate extd. with Et_2O , neutralized, evapd. and treated with PCl_3 and H_2O , yields B. It was next attempted to form derivs. of $\text{PhCH}_2\text{SO}_2\text{N}_2$ analogous to those of Curtius and Rissom (*Z. angew. Chem.* 26, 134 (1913); and Curtius *C. A.* 8, 214) for PhSO_2N_2 . 4.5 g. of NaNO_2 added to 10 g. of C in H_2O and the calcd. HCl , washed with Et_2O , and crystd. from hot EtOH , yield the compound $\text{PhCH}_2\text{SO}_2\text{N}_2$ (E), fine needles, $m. 54^{\circ}$, sol. in Et_2O , EtOH , C_6H_6 and CHCl_3 , volatile with steam, insol. in H_2O . The distillate with steam turns litmus red.

E is hydrolyzed by dil. NaOH. 8 g. of NaN, added to 10 g. of C in 160 g. of warm EtOH, shaken, cooled, filtered and dild. by 1 l. H₂O also yields **E**. 5 g. of **E** boiled with 30 g. of PhMe 9 hrs. liberates 110 cc. of N (calcd. 568 cc.). The mixt. is evapd. *in vacuo*, steam distd., the dark sticky residue extd. with NaOH, cooled, filtered and neutralized yields a yellow ppt. too small for analysis. 5 g. of **E** in 120-50 g. of *p*-C₆H₅Me₂ (**F**) heated 10 hrs. below the b. p., liberates 545 cc. of gas. Excess **F** distd. *in vacuo*, the residue steam distd., the oil made alk., extd. with H₂O, filtered, acidified at 0°, filtered, the ppt. washed with H₂O at 0°, recrystd. from EtOH and H₂O, yields the compound PhCH₂SO₂NHC₆H₅Me₂, soft, pale yellow needles, m. 124°, sol. in NaOH, Na₂CO₃, EtOH, CHCl₃, C₆H₆ and hot H₂O, insol. in dil. acids. NH₂-AgNO₃ is not reduced. It is hydrolyzed by dil. HCl, and can be decompd. to PhMe and *p*-Me₂C₆H₅NH₂ by heating under pressure for 20 hrs. at 110° with concd. HCl. 10 g. of **E** heated 2-3 hrs. at 170° with 100-120 g. of C₆H₆ liberates 1100 cc. of N. (calcd. 1136). The mixt. steam distd. 8-10 hrs., decanted, dissolved in EtOH, dild., boiled with bone-black, cooled, recrystd. from hot abs. EtOH, yields the compound PhCH₂SO₂NHC₆H₅ (**G**), yellow needles, m. 146° (yield 11.5 g.), sol. in NaOH, cold EtOH, Et₂O and CHCl₃, insol. in dil. HCl. It is decompd. to α -C₁₀H₉NH₂ and PhCH₂OH by heating **G** with concd. HCl under pressure at 125-30° for 20 hrs. 5 g. of **B** heated with 8 g. of α -C₁₀H₉NH₂ at 75°, hot dil. HCl added, filtered, washed with warm H₂O, dissolved in NaOH, pptd. by cold dil. HCl and recrystd. from hot abs. EtOH, yields **G**. **G** is also formed by heating with β -C₁₀H₉NH₂ instead of with the α -compd. Two reactions occur with **E** and PhNH₂ (**H**). 10 g. of **E** heated with 130-50 g. of **H** at 140-75° for 6-8 hrs. liberate 750 cc. of N (calcd. 1136), and N₂NH₄ seps. on cooling. This is formed by decompn. of N₂H₄. **H** distd. off *in vacuo*, the residue steam distd., the residue extd. with NaOH, filtered, neutralized and the ppt. recrystd. from hot dil. EtOH, yields 4.8 g. of the compound PhCH₂SO₂NHPh (**I**), white needles, m. 102°, sol. in hot H₂O, EtOH, CHCl₃ and Et₂O. NH₂-AgNO₃ is not reduced. 10 g. of **B** boiled 0.5 hr. with 30 g. of **H**, distd. *in vacuo*, steam distd., the residue extd. with hot dil. EtOH, decolorized by bone-black and cooled, yields **I**. It is hydrolyzed by heating under pressure 20 hrs. at 110° with concd. HCl. The alk. mother liquor in the ptn. of **I** evapd. to dryness, extd. with abs. EtOH, decolorized and concd., yields PhCH₂SO₂NH₂ (**J**), needles, m. 102.5°. The residue from the abs. EtOH extn. digested with dil. HCl, NaOH added drop by drop at 0°, the ppt. filtered, dissolved in EtOH, and several times purified by HCl and NaOH and crystd. from C₆H₆, yields 3.2 g. of *p,p*-diaminotriphenylmethane, prisms with 1 mol. C₆H₆, m. 106°. 7.5 g. of **E** boiled with 80 g. of PhNMe₂, liberates 650 cc. of N (calcd. 853). The mixt. distd. *in vacuo*, steam distd., the oil extd. with dil. NaOH and Et₂O, dried with Na₂SO₄ and crystd. from hot EtOH, yields 0.6 g. of PhCH(C₆H₄NMe₂)₂, colorless plates, m. 93°. The alk. ext. freed from Et₂O, neutralized with HOAc, the ppt. dissolved in boiling Et₂O and decolorized, yields PhCH₂SO₂NHC₆H₄NMe₂, m. 127°. The HOAc mother liquor evapd. and extd. with EtOH yields **J**. C. C. DAVIS

Catalyzers in the reaction between carbon monoxide, hydrochloric acid and aromatic hydrocarbons. A. KORCZYNSKI AND W. MROZINSKI. Univ. Poznan. *Bull. soc. chim.* 29, 459-62 (1921).—Gattermann (*Ann.* 347, 347 (1906)) showed that aromatic hydrocarbons with CO and HCl in the presence of AlCl₃ and CuCl form the corresponding aldehyde. The authors modified this reaction by investigating the reaction of PhMe (**A**) and 1,3,5-C₆H₃Me₃ (**B**) with CuCl replaced by CoCl₂, NiCl₂, FeCl₃, and WCl₆. It was found that these salts show an analogous catalytic property to CuCl, though less active. Through 30 g. of **A**, 45 g. of AlCl₃ and 2.6 g. of NiCl₂ were passed CO and HCl for 6 hrs. at 30°. The procedure of Gattermann (*loc. cit.*) was followed, the product poured in H₂O, steam distd. and combined with NaHSO₄. Liberation of the free aldehyde yields *p*-MeC₆H₄CHO, b. 204°. The yield was 54% of that from CuCl. By the

same method and wts., yields based on that obtainable with CuCl were as follows: 2.6 g. of anhydrous CoCl₃, 50%; 7 g. of FeCl₃, 14%; 8 g. of WCl₆, 5%. Through 30 g. of B, 50 g. of AlCl₃ and 2.6 g. of NiCl₂ were passed CO and HCl for 8 hrs. at 50°. The procedure of Gattermann was followed and 2,4,6-Me₃C₆H₂CHO obtained (no yield given).

C. C. DAVIS

Some methods of purification of *o*-toluenesulfonamide. PHYLLIS VIOLETT MCKIE, Univ. College of North Wales. *J. Soc. Chem. Ind.* 40, 92-4T (1921).—In the pregn. of saccharin by the Fahlberg method the initial stage gives a mixt. of the *o*- and *p*-sulfonyl chlorides in the ratio of 60 to 40. By the partial sepn. of these chlorides and subsequent amidation a mixt. of the *o*- and *p*-amides, in the ratio of 70:30, is obtained. In the sepn. of the amides by patented processes a product containing 90-3% of *o*-MeC₆H₄SO₂NH₂ (A) and 7-10% of the *p*-isomer (B) is obtained. In the Lange method the sepn. of the *o*- and *p*-MeC₆H₄SO₂H and subsequent chlorination and amidation gives a mixt. containing 90% A and 10% B. At 9°, A, m. 156.3°, dissolves in H₂O to the extent of 1:958, while the solv. of B is 1:515. Three fractional crystns. from H₂O of the 90% mixt. gave a product containing 99.2% A, which could be purified further only by fractional sublimation *in vacuo*. By dissolving the solid mixt. in 1 mol. of 8-10% NaOH and then adding HCl, AcOH and H₂CO₃ of varying concns. it was found that AcOH equiv. to 70% of A caused the pptn. of A in the highest purity (99.5%). In this case the loss was large, 30% of A. Extn. of the mixt. with Na₂CO₃ of moderate concn. gave a product with 96% A, and the loss involved was only 2-3%. By extn. once with 50% EtOH (1 part of the mixt. to 5 parts EtOH) 90.7% of A in 97% purity was obtained. By oxidation of the mixt. with KMnO₄ B was oxidized to *p*-HO₂CC₆H₄SO₂NH₂ and 90-4% of A was isolated in a high degree of purity while 5-9% of A was recovered as very pure saccharin.

G. W. STRATTON

11—BIOLOGICAL CHEMISTRY

HATTIE L. HEFT, EDGAR C. MILLER, JR. AND WILLIAM J. GIES

A—GENERAL

FRANK P. UNDERHILL

The action of bases and salts on biocolloids and cell masses. D. T. MACDOUGALL. *Proc. Am. Phil. Soc.* 60, 15-30 (1921).—A study of the swelling of biocolloids in dil. salt solns. in connection with the suggestion that the chief effect of salts in nutrient solns. is in restricting, limiting or defining the hydration of the cell colloids. Hydroxides of the metallic bases were found to decrease the swelling of plates of agar in the order Ca, K, Na, in concns. of 0.01 M. The chlorides show the same relative action. Hydration of agar is increased by the hydroxides of these metals at 0.001 N, but no well defined differences between the metals could be observed. Similar effects were produced by chlorides of Ca, Mg, K, and Na at 0.0001 M, and K and Na at 0.001 M. The purified agar used in the expts. has a p_H value of 6.5 and swells more in HCl of p_H 4.2 than in pure water. The p_H range over which large swelling of the agar occurs is from 4.2 to 11. It also swells largely in 0.0001 M Na and K nitrates, but not in the sulfates. Similar measurements were also made on the swelling of gelatin. The gelatin used had a p_H value of 5.2 and it was noted that both H⁺ and OH⁻ caused increasing swelling with reference to the isoelec. point, at which minimum swelling occurred. The swelling in 0.0001 M KCl (p_H = 5.7) was not much greater than in H₂O; the swelling in KCl 0.001 M (p_H = 5.8) is about double that in H₂O. CaCl₂ solns. induce max. swelling at 0.001 M, but depress hydration as the concn. increases or decreases from 0.001 M. The interest of these results lies in the fact that a mixt. of a vegetable mucilage (pentosan) type of colloid with a protein colloid exemplifies many of the reactions of living or dead

cell masses. Expts. were therefore continued with plates of gelatin 3 : agar 2 parts, and gelatin 2 : agar 3 parts. In the latter, sensitiveness to H^+ was more marked than in the case of agar alone, but the effect of KCl is about the same as that upon agar alone. The mixt. in which gelatin predominated showed increase of swelling as p_H was increased to 2.01, while KCl showed an effect similar to its effect on agar. The work was then extended to living and dead cell masses, such as sections from the roots of *Zea mays* (dominantly pentosan), which paralleled closely those of the agar 3 : gelatin 2 mixt. Roots of strawberry showed different hydration reactions depending on whether they were grown in saline soils or in sand, the latter showing greater hydration. Joints of *Opuntia* (dominantly pentosan) showed max. swelling in 0.01 *N* KOH, HCl at 0.001 *N*, KCl at 0.0001 *M*, all in excess of the swelling in H_2O . "The changes in vol. of living cell masses in hydrating solns. include osmotic-plasmolytic effects in the alteration of the vol. of the included cells." The hydration of dead cell masses includes possible osmotic action of cell walls.

H. W. BANKS, 3rd

Direct proof for the impermeability of the blood corpuscles of man and rabbit for glucose. S. VAN CREVELD AND R. BRINKMAN. *Biochem. Z.* 119, 65-72 (1921).—See *C. A.* 15, 2917.

F. S. HAMMETT

Swelling of fibrin by acids. R. SOMOGYI. Techn. Hochschule, Charlottenburg. *Biochem. Z.* 120, 103-5 (1921).—In expts. of an admittedly crude nature S. found that the following series expresses the order of decreasing ability of the various acids to cause fibrin swelling. $HCl > (COOH) > HCOOH > CH_3COOH > CH_3CICOOH > H_4-PO_4 > lactic acid > tartaric acid > H_2SO_4 > HNO_3 > isobutyric acid > isovaleric acid$. This series follows closely that for gelatin as found by Traube and Köhler (*C. A.* 9, 3259). The strong swelling effect of lactic acid is of significance in muscle activity; the effect of HCl in gastric swelling and that of HCOOH in insect bites. F. S. HAMMETT

Once again hydrogen-ion concentration. I. TRAUBE. Techn. Hochschule, Charlottenburg. *Biochem. Z.* 120, 108-10 (1921).—A repetition of the previously expressed idea that altogether too much importance has been attributed to the biol. detn. of the H-ion concn. and that still other factors such as surface tension effects must be taken into consideration in dealing with acids and bases. F. S. HAMMETT

Alkapton chromogens. G. KATSCH AND GÉZA NÉMÉT. Med. Univ. Klin., Frankfurt a. M. *Biochem. Z.* 120, 212-17 (1921).—When a few cc. of a soln. contg. homogentisic acid, e. g., an alkapton contg. urine, are shaken with a few cc. of Et_2O and the Et_2O is poured over a piece of $CaCO_3$, a more or less transitory blue color is observed. The residual color is yellowish or brown. This is called the alkapto-cyan reaction. When homogentisic acid is administered to some individuals the excreted urine often turns dark, although homogentisic acid cannot be detected therein. The substances which cause this are called the alkapton chromogens. Neither alkapton urines nor urines which contain these alkapton chromogens give the diazo test or the $KMnO_4$ test. Therefore, the alkapton chromogens are not related to the urochromogen of Weiss (*C. A.* 14, 2648), nor is the $KMnO_4$ test an alkapton reaction. F. S. HAMMETT

A new function of the tryptic enzyme (anhydrase) and the recovery of *d*-tyrosine anhydride and *d*-tryptophan anhydride from the products of tryptic digestion. SIGMUND FRÄNKEL AND EMIL FELDSBERG. Lab. Ludwig Spiegl-Stiftung in Wien. *Biochem. Z.* 120, 218-29 (1921).—Casein in alk. soln. was digested with trypsin in the presence of $CHCl_3$ and toluene until it failed to give the Br-water reaction. At this stage no free tryptophan was present. The alkali was neutralized with concd. H_2SO_4 , and 5% by vol. of the acid was added. The ppt. after filtration and washing with dil. H_2SO_4 gave no tryptophan reaction. To the filtrate was added 10% $HgSO_4$ soln. in 5% H_2SO_4 at intervals until no further turbidity was produced. The ppt. was filtered off and washed well. It gave a strong Adamkiewicz reaction and on working up yielded

d-tryptophan anhydride. *d*-Tyrosine anhydride was recovered from the filtrate. The details of the methods cannot be abstracted. These results lead to the belief that either trypsin or an enzyme accompanying it acts to form the anhydrides of the 2 amino acids noted. This belief is based on the detn. of the free NH₂ groups and the absence of free carboxyl by the formol titration method. F. S. HAMMETT

The chemistry of the formation and maturing of bee's honey. E. SARIN. Riga. *Biochem. Z.* 120, 250-8(1921).—Bees were fed on sucrose and the character of the honey produced was examd. from time to time. The results indicate that as the sucrose is split there is formed a certain amt. of dextrin-like substances which do not reduce Fehling soln. These seem to be the products of a reversible activity of the invertase. Consequently similar changes occur in the prepn. of natural honey. The enzymes invertase and diastase seem to be specific products of the bee's activity, while catalase, which is present in natural honey but not in sugar honey, is considered as a product of plant origin. F. S. HAMMETT

The influence of organic acids on the formation and maturing of sugar honey. E. SARIN. Riga. *Biochem. Z.* 120, 259-64(1921).—S. fed bees sucrose to which was added citric or salicylic acid and studied the compn. of the honey produced at intervals thereafter. All the biochem. processes concerned in the making and ripening of the honey were more or less suppressed by the action of these added acids. F. S. H.

Potassium and radioactivity. S. G. ZONDEK. Univ. Berlin. *Biochem. Z.* 121, 76-86(1921).—A discussion of Zwaardemaker's theory of the physiol. action of K based on its so-called radioactivity (*C. A.* 13, 2044) to which Zondek cannot subscribe. Zondek is unable to dissociate the action of the K ion from that of the Na and Ca ions and considers that this trinity acts as a physiol. unit of far-reaching interdependency. F. S. HAMMETT

Physico-chemical studies on body fluids. IV. The condition of the sugar in the serum. STEFAN RUSZNYÁK AND GÉZA HÉTENYI. Univ. Budapest. *Biochem. Z.* 121, 125-6(1921).—By the technic described in an earlier article (*C. A.* 15, 1560) the blood serum was subjected to ultra-filtration and the total reduction was detd. in the original serum and in the ultra-filtrate. To a second portion yeast was added and after fermentation was finished the "rest-reduction" was detd. by Ege's method (*C. A.* 15, 111). The percent of reducing substances in the original serum was greater than in the ultra-filtrate. This difference is considered as conditioned by the colloidal, unfilterable state of a part of the serum sugar. The amt. of this colloidal part is independent of the concn. of the total sugar, is rather const. and is about 0.02 to 0.03 g. in 100 g. of serum. F. S. HAMMETT

Calcium combination by animal tissues. E. FREUDENBERG AND P. GYÖRGY. *Biochem. Z.* 110, 299-305(1920).—Cartilage takes up (combines with) Ca; other tissues do likewise. The combination or adsorption, or whatever it is, is said to be a function of the H-ion concn., which is what one would expect. II. *Ibid* 115, 96-108(1921).—This paper deals with the effect of various anions and cations on Ca retention by cartilage as well as similar effects brought about by brain tissue. The displacement of Na by Ca in protein combinations is also briefly reported. It appears that while cartilage from calves and growing man can remove Ca from its solns. with any anion, cartilage from sucklings and fetuses can only retain but little, if any, of the Ca offered in the form of acetate or nitrate. Other bivalent and trivalent cations can be adsorbed from soln. and the series Mg < Ca < Sr < Ba < Al was obtained: When both Ca and Mg ions are present in soln. both are removed in lesser amt. than when either is present alone. Apparently Ca can replace Mg to a greater extent than Mg can replace Ca. Brain tissue combines with Mg more effectively than with Ca, although Ca can replace Mg even in relatively small amts. III. *Ibid* 118, 50-4(1921).—Pieces of bone were put in 0.72 N CaCl₂, 2.60 N MgCl₂, and 0.285

N NaCl solns. After 5 days they were removed, rinsed with distd. H₂O and dried. A portion was then analyzed for Ca, Mg and P₂O₅ while the rest was put in *M/3* phosphate mixts. of *pH* 7.4 and 6.5. After 3 days these were removed, washed, dried and analyzed. The results showed that the preliminary treatment with Ca and Mg induced an increase in the P₂O₅ content after immersion in the phosphate mixt. This did not occur when the bones had been treated with NaCl. This was confirmed by other expts. and leads to the conclusion that the combination of alkaline earths with the bone colloids possesses the power to hold phosphoric acid. This is not considered as a purely mechanical impregnation of the colloid with the alk. earth but as consisting of a chem. union between these and the bone colloids. IV. *Ibid* 121, 131-41 (1921).—The swelling capacity of cartilaginous tissue was studied under various conditions of H-ion concn. in the presence of Na, Ca and Mg compds. It was found that the naturally Na-rich cartilage swells better than the same tissue which has had its Ca content artificially increased. Cartilage made rich in Mg reacted between the two. All three had a minimum reaction at a *pH* of 4.7, which is related to the iso-electric point of the cartilage proteins. Cartilage which has been artificially enriched with Ca or Mg is relatively independent of changes in H-ion concn. as compared with untreated material. This relation is attributed to the low dissociation capacity of the Ca- and Mg-treated tissue. Tests in phosphate mixts. show exactly the same mass-law effect in the swelling capacity of cartilage as in acetate or maleate mixts. Dried cartilage shows a certain small swelling capacity of a similar character as that observed with the tissue artificially enriched with Ca. V. *Ibid* 142-9.—Further studies on the conditions underlying Ca combination with cartilage. This tissue can combine with Ca from a 0.01 *N* Ca soln. when 1 part of dried cartilage is put with 10 parts of the soln. At lower concns. an equil. obtains between the Ca content of tissue and soln. At still lower concns. the tissue gives up Ca to the soln. When the cartilage has been treated with trypsin the taking up of Ca is retarded. A similar effect is produced by urea and NH₄Cl. These results make it appear as if there are normally present in the body conditions adequate for calcification and that the organism protects itself from this process by certain retarding mechanisms derived from metabolism. When these are suppressed calcification sets in.

F. S. HAMMETT

Action of salts and nonelectrolytes upon buffer solutions and amphoteric electrolytes and the relation of these effects to the permeability of the cell. DOROTHY HAYNES. Imperial College of Science and Technology. *Biochem. J.* 15, 440-61 (1921).—“The theory of buffer solns. shows that an increase of H-ion concn. normally results from the addition of neutral salts, a decrease from the addition of nonelectrolytes.” A theory of permeability is suggested. The phenomena of antagonism can be explained as resulting from the different effects of different cations on the reactions of the buffer mixt. of the protoplasm. The bearing of the theory on stimulation and narcosis is pointed out.

BENJAMIN HARROW

The energy requirements of girls from 12 to 17 years of age. FRANCIS G. BENEDICT AND MARY F. HENDRY. Boston. *Boston Med. Surg. J.* 184, 217-22, 257-62, 282-6, 297-300, 329-34 (1921).—The av. minimum resting pulse rate per min. of girls from 12 to 17 yrs. of age, just before arising in the morning, was found to be 81 at 12, 77 at 13, 77 at 14, 83 at 15, 71 at 16 and 74 at 17 yrs. The insensible perspiration for these girls per kg. body wt. per hr. was as follows: 0.72 g. at 13, 0.71 g. at 14, and 0.77 g. at 15 yrs. The R. Q. of groups of 12 girls each, about 7-8 hrs. after a light meal, were 0.81, 0.81, 0.78, and 0.79. The cal. requirement of young girls during 10 hrs. of “bed rest” was on the av. 55 cal. per individual per hr. The av. 24-hr. basal heat production of girls from 12 to 17 yrs. of age was 1250 cal. per individual, irrespective of age. The heat production per kg. body wt. per 24 hrs. decreases regularly with increase-

ing age from 29.9 cal. at 12 yrs. 2 mos. to 21.7 cal. at 17 yrs. The curve indicating the general metabolic trend is throughout its entire length materially below the few scattered observations of earlier writers. The heat production per sq. m. of body surface per 24 hrs. likewise decreases, but not so regularly, with increasing age, ranging from 928 cal. at 14 yrs. to 745 cal. at 16 yrs. The metabolism of groups of young girls can be predicted from the general curve, indicating the heat production per kg. of body wt. referred to age within an error of 3.1%. The heat prediction for the heat production per unit of body wt. is somewhat better than that per unit of surface area. The curves representing the heat production per kg. of body wt. and per sq. m. of body surface referred to wt. for these groups of girls from 12 to 17 yrs. of age blend with remarkable uniformity with similar curves based upon the measurement of a large no. of normal girls from birth to 12 yrs. of age. No influence of puberty or the prepubescent stage is clearly proved in any of the results.

JULIAN H. LEWIS

Studies of the colloidal state of proteins in yeast extracts. II. Yeast phosphoprotein in the sol state as a colloidal ferment. A. Fodor. Univ. Halle. *Kolloid-Z.* **29**, 28-45 (1921); cf. *C. A.* **15**, 374.—Further investigation confirms the suggestion in the first paper that the original yeast-juice protein corresponds to the denatured state of the yeast phosphoprotein. The yeast phosphoprotein was shown to be a substance whose action as a ferment is evidently connected with its physical state. Three series of expts. were made to define the colloidal nature of yeast phosphoprotein and to study its action as a ferment. (1) A soln. of 2 g. of yeast-juice protein with 5 cc. 0.1 *N* NaOH in 250 cc. was used for detg. the coagulation optimum. When enough acid was added to make the p_{H} value 6.6, as detd. by Sorensen's indicator method with *p*-nitrophenol, an immediate coagulation resulted. The same p_{H} value was required for solns. of HCl, AcOH, H_2SO_4 , or $\text{H}_2\text{C}_2\text{O}_4$ but p_{H} values of 6.4, 5.6 and 5.4, resp., were required for solns. of H_3PO_4 , K_2HPO_4 and Na citrate. The coagulation optimum of yeast juice protein is not a function of H^+ concn. alone. Varying the amts. of protein present as low as 0.1 that in the original soln. had no effect on the coagulation optimum. An increase of NaCl concn. favored coagulation. The same quantity of HCl, when added drop by drop, which caused complete coagulation, gave, if added quickly, only an opalescent or even a perfectly clear soln. in which the acid effected again the dispersion of the coagulated particles. Whether a detd. acid concn. would effect a "soln." of the protein or not depended only on the nature of the surface of the reacting proteins. (2) The coagulation optimum for a 1% soln. of yeast phosphoprotein was not detd. by H^+ concn. alone. The p_{H} value for coagulation optimum, in the presence of salt, and with long standing rose, through splitting off phosphoric acid, from 5.2 to 6.6. At the same time amphoteric properties appeared which were not present in the original phosphoprotein. From a study of cataphoresis, with the U-shaped app. of L. Michaelis, F. concluded that yeast phosphoprotein forms a distinctly acid reacting soln. which, under the influence of elec. potential, moves to the anode. This cataphoresis increases with greater dispersion of the sol but only so long as strongly hydrated albuminous ions do not form. These hydrated ions do not show cataphoresis but are conductors of electricity. In order to correlate the physical, chemical and physico-chemical results of these expts., the phosphoprotein is regarded as contg. phosphoric acid as an active reaction group. No assumption is made as to how this acid is joined to the protein complex. The albumin chains which are the units built into the physical structure of the colloidal particle are not laid together like fagots but combined together in the sense of v. Veimarn's girder framework theory. Just as crystals possess a lattice structure, so colloidal substances possess their characteristic structures. What appears as the adsorbing surface, is, in this sense, the resulting arrangement of the reacting atomic groups on the surface of the colloidal structure, which thus det. the ability to react

and the affinity of the whole. The colloidal particle of phosphoprotein suspended in pure water becomes charged negatively because of its affinity for OH^- . Immediately surrounding the surface must be H^+ . This is represented, thus $[(\text{Pr}-\text{PO}_4)\text{---}\text{OH}^-]\text{H}^+$

or $\left[\left\{ \text{Pr}-\text{PO}_4 \right\} \text{---}\text{OH}^- \right] \text{H}^+$ The presence of alkali causes swelling of the particles by taking up water to form the complex $[(\text{Pr}-\text{PO}_4)\text{---}\text{OH}^-]\text{Na}^+\text{---}\text{H}_2\text{O}$.

The two extremes of this dispersion which would hasten towards a limiting condition are represented, the one by the *enhydron* $(\text{Pr}-\text{PO}_4)\text{---}\text{OH}^-$ (H^+) which may show cataphoresis and the other by the *ekhydron* $[(\text{Pr}-\text{PO}_4)\text{---}\text{OH}^-]\text{Na}^+\text{---}\text{H}_2\text{O}$ which is characterized by its ionic behavior and its inactivity in a biological respect. Ion splitting with the formation of enhydrons as a result of its property of activating of water is considered the fundamental characteristic of fermentative and of correlative oxidation and reduction in the hydroclastic processes in biological reactions. (3). Glycyl-*L*-leucin was used as the substrate to prove the dependence of the optimum H^+ concn. upon the colloidal state of the ferment. The enhydrons are considered less active as a ferment than the complexes

$\left[\left(\text{Pr}-\text{PO}_4 \right) \begin{matrix} \text{---}\text{OH}^- \\ \text{---}\text{OH}^- \end{matrix} \right] \text{H}^+$ which have larger surfaces and show the phenomena

of cataphoresis more strongly. The increase of the surface of these complexes favors the splitting of the substrate. H. M. McLAUGHLIN

The peptolytic enzymes of hemolytic streptococci; methods. R. WEST AND F. A. STEVENS. *Columbia Univ. Proc. Soc. Exptl. Biol. Med.* 18, 234-6 (1921).—The peptolytic enzymes of hemolytic streptococcus were sep'd. in a sterile soln. and the action was noted on 1% peptone soln. The increase in amino N was between 14 and 26 mg. %. By varying the H^+ concn. a max. activity was found at $p\text{H}$ 7.0. The acid end-point of activity was about $p\text{H}$ 4.5. Heat destroyed the enzyme readily. V. C. MYERS

Doctrine of specific proteins and morphology, with special reference to questions of heredity and the structure of the placenta. ORRO GROSSER. *Anat. Anz.* 53, 49-57 (1920).—The specificity of protein substances cannot be questioned and the reaction response on the part of the body to heterologous protein is elicited only when the protein is introduced by a parenteral route. Epithelium is a morphologic expression of protection and this protective mechanism is efficient as long as the epithelium is intact. Not only is cutaneous and intestinal epithelium impervious to unaltered protein mols. but so also are the cellular elements of the placenta. Thus, unaltered maternal protein cannot penetrate the fetus and a limit is placed upon the inheritance of maternal characteristics. Specificity of protein is not limited to species differences (such as can be detected by chem. or immunologic means) but there must be individual inheritable differences referable only to the mol. structure of the germ cells. G. H. S.

Decisive test for tyrosinase and additional facts concerning the tyrosinase reaction. HUGO HAEHN. *Fermentforschung* 4, 301-15 (1921).—Tyrosinase is shown to consist of a dialyzable and a non-dialyzable constituent. The former is replaceable by such inorg. salts as Ca, K, Cd and Zn salts though the nature of the color resulting varies with the salt. The salts do not function by causing the aggregation of mols. already formed through the action of the tyrosinase proper on tyrosine but by participation in the oxidation process. R. L. STEPLE

Influence of the structure and configuration of substrate (polypeptides) on enzyme action. E. ABBERHALDEN AND H. HANDOVSKY. *Fermentforschung* 4, 316-26 (1921).—Yeast juice which hydrolyzed glycyl-*L*-leucylglycyl-*L*-leucine did not hydrolyze glycyl-*d*-leucyl glycyl-*L*-leucine. Evidence is presented indicating that the difficulty in the latter case is not due to a failure of the peptide and enzyme to combine. R. L. S.

Studies on the enzymic hydrolysis of polypeptides containing amino acids not yet obtained from proteins. E. ABERHALDEN H. KÜRTEN. *Fermentforschung* 4, 327-37 (1921).—Glycyl-*d*-norvaline was hydrolyzed by yeast juice but glycyl-*l*-norvaline was not. This suggests the possibility that *d*-norvaline occurs in nature while *l*-norvaline does not.

R. L. SREHLE

Studies on enzymes. VII. The organic components of the diastases and the real mechanism of starch hydrolysis. W. BIEDERMANN. *Fermentforschung* 4, 359-96 (1921); cf. *C. A.* 15, 1539, 2885.—The diastatic action of saliva is intimately associated with a substance having the reactions of a proteose. This substance may be isolated by extg. the alc.-insol. material in saliva with a dil. NaCl soln. An apparently identical substance may be isolated also from malt, egg white and gum arabic. Inorg. salts must be present before the proteose displays any diastatic action. The autolysis of starch is attributed to traces of diastase which has resisted processes employed in the prepn. of the starch even including heat. The deleterious action of heat is not only upon the org. component of the diastase but upon the activating salts as well. R. L. SREHLE

New observations in the study of bilirubin. W. KÜSTER. Stuttgart. *Z. angew. Chem.* 34, Aufsatzteil, 246-7 (1921).—Bilirubin is conveniently purified through its cryst. NH₄ salt, by passing dry NH₃ into a suspension of the crude product in boiling MeOH until soln. results. On concg. in a stream of H₂ and treating with NH₃, the NH₄ salt is obtained and may be crystd. from 15 parts of warm C₆H₅N. In spite of the similarity of bilirubin and the porphyrins, they differ in their reactions with HBr and HI in AcOH soln.; bilirubin does not give any basic substance, that is, any substance corresponding with hematoporphyrin, when the reaction product is poured into H₂O. On the contrary, 3 mols. of HBr react, and 2 Br atoms only are displaced by the action of H₂O. Hydrolysis with MeOH eliminates 2 HBr, while the 3rd can only be removed with alkali. While mesoporphyrin in HCl-AcOH is converted by H₂O₂ into tetrachloromesoporphyrin, bilirubin under the same conditions gives the dibasic *hexachlororubilinic acid*, C₁₈H₂₀O₆N₂Cl₆, m. 160°. Bilirubin can therefore be attacked in 2 directions: by reduction, when an acid nucleus remains connected by a CH₂ group with a basic nucleus, and by oxidation, when 2 acid nuclei remain in the reaction product and the basic nucleus is destroyed.

C. J. WEST

The specific action of urease of *Canavalia*. D. H. WESTER. L'Ecole supérieure de Guerre, La Haye. *Rec. trav. chim.* 40, 320-2 (1921).—Pin Yin Yi (*C. A.* 14, 2803) recently reported that the urease of *Robinia pseudacacia* acts upon Me₂NCONH₂ and Et₂NCONH₂ indicating that the specificity of urease (Armstrong, Horton, *C. A.* 7, 1202) is not general and that there are various kinds of urease. Since W. has observed that urease from *Canavalia* beans behaves differently in some respects than that from soy beans he has made expts. to det. whether it was similar to the urease from *Robinia*. Two exts. were prep'd. by the method previously described (*Pharm. Zentralh.* 1916, 423; and *C. A.* 14, 2803). MeNHCONH₂, Me₂NCONH₂, (EtNH)₂CO, Et₂NCONH₂ and Et carbamate were tried with these urease preps. in various ways but no amines were liberated with any of them, although the urease from *Canavalia* was about 20 times as strong as that from soy.

E. J. WITZEMANN

B—METHODS AND APPARATUS

STANLEY R. BENEDICT

The saccharorefractometer, a new apparatus for the quantitative determination of sugar. P. DILG. *Münch. med. Wochschr.* 68, 46-7 (1921).—The app. utilizes the refraction of sugar for its detn. From the description, the app. appears simple and easily handled and accurate when used with sugar solns. In case of urine certain corrections have to be made, dependent on the color of the urine.

S. AMBERG

A new method for the quantitative determination of bilirubin in blood serum. G. HASELHORST. Univ. Hamburg. *Münch. med. Wochschr.* **68**, 175-6(1921).—To 1 cc. clear blood serum are added 2 cc. 96% alc. After shaking the pptd. protein is sepd. with the centrifuge. The supernatant fluid is usually somewhat turbid. One cc. of it is placed in a graduated tube and 2 drops of Ehrlich's diazo reagent are added. In the presence of bile pigment a violet color becomes manifest after a varying period of time. After 5 min., 96% alc. is added to another mark. Shaking for a short time clears the turbidity. The color becomes reddish violet. If it is more intense than the standard it is dild. with water in the graduated tube until the color matches the standard contained in the companion tube. The standard is prep'd. as follows: Bordeaux red (Merck) 0.01, distd. water 7.0, 96% alc. soln. of methylene blue (0.01:50.0) 3.0, alc. 96% to 100. This soln. is to be kept in a dark bottle and keeps at least 6 weeks. To 14 cc. 96% alc. 1 cc. of this stock soln. is added to obtain the standard for comparison. The standard is chosen of such intensity that it corresponds to the color obtained by the diazo reaction with a 1:200,000 bilirubin soln. The test-tube is marked so that a diln. of the reaction mixt. to the 100 mark designates a serum contg. 1:100,000. The upper limit is placed at 1:25,000 for convenience sake. Some sera yield a more yellowish red-brown color on carrying out the reaction. A further drop of the diazo reagent elicits as a rule the red-violet color. Too much blue means the addition of too much diazo reagent.

S. AMBERG

The diffusible calcium of the blood serum. I. A method for its determination. L. VON MEYSENBUG, A. M. PAPPENHEIMER, T. F. ZUCKER AND MARJORIE F. MURRAY. Columbia Univ. *J. Biol. Chem.* **47**, 529-39(1921).—Serum is obtained by whipping and centrifuging blood. Four cc. are measured into a dialyzing thimble (Schleicher and Schüll No. 579A) and dialyzed against 4 cc. of a mixt. of equal parts of a soln. contg. 252 mg. NaHCO₃, 8.8 mg. KH₂PO₄, 10.59 mg. MgCl₂, 29.6 mg. KCl and 625 mg. NaCl in 50 cc. and a CaCl₂ soln. contg. 0.168, 0.210, 0.258 or 0.297 mg. Ca in 2 cc., the mixt. being satd. with an air-CO₂ mixt. of known CO₂ tension. The dialyzing liquid is contained in a Pyrex tube 3.5×1 in., the level of the serum is kept at that of the outside liquid and the whole app. is kept in a sealed jar with an air-CO₂ mixt. of desired compn. for 24 hrs. Ca in the serum and dialyzate is then detd. by Lyman's method (*C. A.* **11**, 1440) and the % of diffusible Ca is detd. by calcn. Diffusible Ca = [(2×Ca in dialyzate after dialysis) - Ca added to dialyzate]÷original serum Ca. In the serum of normal men and dogs the diffusible Ca was found to be 60-70% of the total Ca. This % was not altered by changes in CO₂ tension between 17 and 62 mm. I. GREENWALD

A simple laboratory gas meter and an improved Haldane gas analysis apparatus. H. S. NEWCOMER. Henry Phipps Inst., Philadelphia. *J. Biol. Chem.* **47**, 489-94 (1921).—The ordinary 5-light gas meter, which has 2 leather bellows in closed compartments operating as a tandem reciprocating engine to drive a vertical shaft, may be used to measure the vol. of expired gases in respiration expts. One revolution of the shaft = 3540 cc. (approx.). The vol. delivered in a fraction of a complete rotation is not proportional to the degree of rotation but this may be corrected for or, with reasonably large vols., disregarded. The Haldane gas analysis app. is improved by introducing a more adequate rack for the Hg bulb and another for the KOH bulb, by reducing the amt. of rubber connection used, by providing a Hg trap between the buret and the KOH bulb, by providing more graduations on the gas buret and by enclosing the whole app., with the exception of the leveling bulbs, in a H₂O-bath, with plate-glass front. I. GREENWALD

The method of elementary analysis in the direct determination of carbon dioxide and oxygen in the Berthelot bomb and its importance in the study of the metabolic balance of herbivora. W. KLEIN AND MARIA STEUBER. Landw. Hochschule zu Berlin.

Biochem. Z. 120, 81-9 (1921).—A brief description of the application of the Berthelot calorimeter bomb for the detn. of the CO₂, O and N of foodstuffs, urine and other products. An analysis can be completed in 15 min. with an error of 0.025% for O and of 0.10% for CO₂. This direct method of detn. is advocated on the basis of the production, particularly in herbivora, of gases, such as CH₄, which do not enter into the usual measurements of the respiratory quotient and hence being unaccounted for by accurate detns. give rise to errors of calen.

F. S. HAMMETT

A new viscostalometer for the determination of surface tension and friction for fluids of widely different viscosity. I. TRAUBE. Techn. Hochschule Charlottenburg. *Biochem. Z.* 120, 106-7 (1921).—A simple stalometer is described with 4 or 5 accessory capillary attachments of different lengths and widths: number 1 is for H₂O, number 4 for glycerol and thick oils, while numbers 2 and 3 are for intermediate solns. or liquids.

F. S. HAMMETT

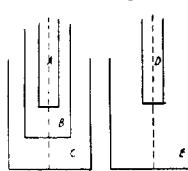
Detection and determination of morphine and other alkaloids in animal excretions and tissues. CURT WACHTEL. Univ. Breslau. *Biochem. Z.* 120, 265-83 (1921).—500 cc. of morphine-containing urine is made weakly acid with H₂SO₄ and treated with 50 cc. of Pb subacetate soln. The filtrate is freed from Pb by H₂S; the PbS removed by filtration and the H₂S by evapn. to 50 cc. on a water-bath. The resultant soln. is neutralized with a few drops of NaOH soln. and immediately reacidified with 25% H₂PO₄. After cooling, 5 cc. of a 10% soln. of phosphotungstic acid is added and the whole dild. to 200 cc. with distd. H₂O. The ppt. is washed with dil H₂PO₄ and taken up in 10 to 20 cc. H₂O. A few drops of NaOH soln. are added until the ppt. goes into soln. and a deep blue color is developed. NaK tartrate is added almost to satn., the mixt. is heated to boiling, made to a vol. of 35 cc. and allowed to stand in thermostat at 40-50° for 4-6 hrs. Nineteen cc. are then transferred to a 200-cc. Erlenmeyer flask and 10% tartaric acid is added drop by drop until an acid reaction is obtained. The mixt. is heated to boiling, there are added a bit of BaCO₃ and 10 cc. of 0.01 N K₃Fe(CN)₆ and the whole is warmed to 50° over the free flame and kept at this temp. for 30 min. in a water bath. After ½ hr. there are added 1 cc. of a 5% KI soln. concd. HCl in great excess and a few drops of starch soln. The mixt. is titrated with 0.01 Na₂S₂O₃ until the blue color is absent for 5 min. The detn. of morphine in the tissues follows the same general scheme. The organs are minced in alc., acidified with H₂SO₄ and evtd. in the reflux condenser. The alc. is distd. off, the residue dild. with H₂O, acidified with H₂SO₄ and treated as described for urine. Pb subacetate is insufficient for brain, muscle and intestine. A second ptn. with CuSO₄ is necessary. The method can be modified for the detn. of nicotine, aconitine, strychnine, quinine, etc. Studies of the excretion of morphine showed that by the second day significant amts. are being eliminated in the urine after its subcutaneous injection. Only about 25% of the amt. administered could be recovered from urine and feces during a long interval. Within 5 mins. of its injection it has disappeared from the blood. The detns. of the morphine content of the organs were too variable in the different animals used to allow of definite conclusion as to storage.

F. S. HAMMETT

A micro-method for nitrogen determination. D. Acét. Univ. Budapest. *Biochem. Z.* 121, 120-4 (1921).—A direct Nesslerization method is described. The author is unacquainted with Folin's later work. A weighed amt. of the material to be tested is transferred to a Jena test-tube 20×180 mm. and 0.05 cc. concd. H₂SO₄ is added. The tube is heated in the flame of a micro-burner. When the H₂O is driven off the residual liquid is brown. On further heating for 4-5 min. this becomes colorless. No catalyst is necessary. Ten cc. NH₃-free H₂O and 0.3 cc. 50% NaOH are now added, 0.5 cc. of 50% NaK tartrate soln. and 0.5 cc. of Nessler-Winkler reagent. A control tube is prep'd. and to it is added, from a micro-buret reading to 0.01 cc., a soln. of NH₄Cl contg.

0.05 mg. N per cc. until the color of the contents of the control tube is the same as that of the sample. No colorimeter is used, the color comparisons being made against a white sheet of paper. The method is advocated for the detn. of N in blood serum, urine, etc. An accuracy of 1 to 2% is claimed. No results are given. F. S. H.

Color standards for the colorimetric measurement of hydrogen-ion concentration. LOUIS J. GILLESPIE. Mass. Inst. Tech. *J. Bact.* 6, 399-405(1921).—The recently published studies of Medalia are in disagreement with other published data (cf. *C. A.* 15, 244). A colorimeter for two-colored indicators is described for the measurement of the H-ion exponent of indicators. The optical assumptions underlying its use are



practically the same as those on which ordinary colorimetry are based. The instrument is used as follows. The glass vessels *A* and *C* are fixed in position, and *B* can be moved up and down, the motion being measured by a pointer (not shown) fixed to *B* and moving on a scale divided into 100 parts. The pointer moves from 0 to 100 when *B* moves from contact with *C* to contact with *A*. The acidified indicator soln. may be placed in *B* and the alk. indicator soln. of the same strength in *C*. *A* is left empty. If the scale reads 70 the path of light along the left dotted line passes through the alk. form of the indicator for 10% of its path and the acid form for 30%. The right along the right hand dotted line traverses an indicator soln. in tube *E*, again of the same strength, and over a path equal in length to the total path on the left. The soln., the *pH* of which is unknown, is placed in tube *E*, in which titrations may be made.

J. T. M.

Aldehydes as mordants in the staining of fats and lipins. J. LORRAIN SMITH AND THEODORE RETTIE. Univ. of Edinburgh. *J. Path. Bact.* 24, 364-5(1921).—In a satd. aq. soln. benzaldehyde acts as a mordant of fat and myelin, but the staining is not so intense or so regular as that obtained from HCHO or Ach. No staining of fat is obtained after treatment with furfuraldehyde. Pure solns. of aldehydes do not mordant; the presence of a polymer is necessary. The polymer need not be derived from the same aldehyde. The reaction occurs at room temp., but is more rapid at 37°. Light accelerates the reaction.

JOHN T. MYERS

Preparation of collodion sacs for use in bacteriology. F. L. GATES. Rockefeller Inst. *Proc. Soc. Exptl. Biol. Med.* 18, 92(1920).—Expts. on the dialysis of NaCl through the collodion sacs described indicate a uniformly high degree of permeability, which is lost during heat sterilization if the membrane was previously allowed to dry. The sacs are permeable to gases in soln., to inorg. salts, to dextrose, to certain protein split products nutritive to bacteria, and to certain toxic products of bacterial metabolism, but they hold back antibodies, unsplit proteins, and formed elements such as bacteria and body cells.

V. C. MYERS

A modification of Folin's uric acid method. H. JACKSON, JR. AND W. W. PALMER. Johns Hopkins Hosp. *Proc. Soc. Exptl. Biol. Med.* 18, 126-7(1921).—By dialyzing Folin's soln. under special conditions and evapg. the soln. so dialyzed, a superior reagent is obtained. No ppt. is formed in the use of the reagent; the color developed is 4½ times as great as that with Folin's method, and the color does not fade in many hours. V. C. M.

Colorimetric determination of hydrogen-ion concentration by means of a double-wedge comparator. G. D. BARNETT AND C. W. BARNETT. Stanford Univ. Med. School. *Proc. Soc. Exptl. Biol. Med.* 18, 127-131(1921).—The method of detg. H⁺ concns. colorimetrically without the use of buffer solns. is extended to the group of indicators described by Clark and Lubs. Values of the dissociation const. at 20° of each of the indicators are given. A double glass wedge comparator is described for making such detns.

V. C. MYERS

The determination of lung volume without forced breathing. D. D. VAN SLYKE AND C. A. L. BINGER. *Rockefeller Inst. Proc. Soc. Exptl. Biol. Med.* **18**, 141-2 (1921).—By basing the calcn. of lung vol. not upon the diln. of 1 gas but upon the vol. ratio of 2 gases, N and H, it is possible to make the detn. without forced breathing.

V. C. MYERS

A clinical method for the quantitative estimation of calcium in blood. M. KAHN AND L. G. HADJOPoulos. *Beth Israel Hosp., N. Y. Proc. Soc. Exptl. Biol. Med.* **18**, 200(1921).—To 1 cc. of blood serum in a 10-cc. test-tube add 4 cc. of a 1% soln. of $(\text{NH}_4)_2\text{C}_2\text{O}_4$. Let stand $\frac{1}{2}$ to 1 hr. and centrifuge 5 min. Pour off supernatant fluid and wash ppt. 3 times with distd. H_2O , the ppt. being recovered by centrifugation. Add to the sediment 1 cc. distd. H_2O and transfer quant. to a vitreosil crucible. The H_2O is slowly evapd., and the ppt. burnt in a strong flame until CaO is formed. Dissolve the ash in $\frac{1}{2}$ cc. of 0.02 *N* HCl, add 1 cc. distd. H_2O and titrate excess of HCl with 0.01 *N* NaOH, with phenolphthalein as indicator. The amt. of CaO can now be calcd. V. C. M.

A cheap and convenient source for glutamic acid. C. L. A. SCHMIDT AND G. L. FOSTER. *Univ. Calif. Proc. Soc. Exptl. Biol. Med.* **18**, 205-6(1921).—Expts. with Ajinomoto (a com. prepn. of Na glutamate) were carried out to use this substance as a source for pure glutamic acid. Ajinomoto is dissolved in a small quantity of H_2O (600 cc. for each 100 g.) and HCl is added in an amt. equiv. to the amino N present. Purified charcoal is added, the mixt. brought to boiling, filtered hot and the filtrate placed in the ice chest to crystallize. The crystals are drained, washed with ice H_2O until free from Cl and dried. From the mother liquor and washings, after concn., a 2nd crop of glutamic acid may be isolated. From 100 g. Ajinomoto 55 g. glutamic acid were obtained. The purified product yielded the theoretical N value, and a 5% soln. in 10% HCl gave a sp. rotation of +31.5°. V. C. MYERS

An apparatus for measuring ionization in radiology (SOLOMON) 3.

C—BACTERIOLOGY

A. K. BALLS

A specific increase of function. W. WEICHARDT. *Münch. med. Wochschr.* **68**, 39-40(1921).—Skin, head, stomach and intestines are removed from guinea pigs. The rest is minced. Aq. and alc. exts. are prep'd. from equal amts. of guinea pigs with the aid of boiling. The alc. ext. stimulates the growth of streptococci very markedly. When treatment with 0.1 *N* lactic acid preceded the extn. with alc. the stimulation of the growth of the bacteria became still more pronounced. This alc. ext. contained less N than the one prep'd. without previous treatment with lactic acid. S. AMBERG

The application of the difference in capillary elevation of various bacteria in filter paper to the bacteriological feces diagnosis. A. HOFMANN. *Münch. med. Wochschr.* **68**, 71-2(1921).—The result of Friedberger and Putter were confirmed, that typhoid and paratyphoid bacilli rise higher in strips of filter paper dipped in mixts. of bacteria, than colon bacilli or some other microorganisms. From pieces of feces, in an epidemic due to *Bacillus paratyphus* B., emulsified in saline soln. it was possible in only 8 of 40 cases to demonstrate the paratyphoid bacillus by this method, while the malachite green agar plate method was successful in 38 instances. The capillary elevation of bacteria can very easily be influenced unfavorably by addition of very dil. acids or alkalies and by the presence of many other substances. S. AMBERG

The influence of calcium salts on the starch-liquefying enzyme of *Aspergillus oryzae*. GEN-ITSU KITA. *Mem. Coll. Eng. Kyoto Imp. Univ.* **2**, 1-5(1918).—An investigation of the effects of the presence of small amts. of CaCl_2 , CaSO_4 , and MgSO_4 on the liquefying and saccharifying power of the enzyme of *Aspergillus oryzae*. With potato starch and rice starch as substrates, it was found that the Ca salts increased

(accelerated) the liquefying power of the enzyme even in cases where its saccharifying power was simultaneously diminished.

J. A. BRADLEY

Phenol red as indicator for the acidity of mediums. A. MASSINK. *Pharm. Weekblad* **58**, 1133-6 (1921).—For the colorimetric detn. of p_H values of bacterial culture mediums in the neighborhood of p_H 7-8, neutral red is preferable to phenol red. The latter is strongly influenced by the salt content of the medium; with mediums of low salt content it gives too low values, and with mediums of high salt content it gives too high values of p_H . Following are typical data—

| I. Salt water | Conductivity. $K_{18} \cdot 10^6$. | Neutral red. p_H . | Phenol red. p_H . |
|---|--|-------------------------|------------------------|
| | 33550 | 7.10 | 7.35 |
| II. Same, dild. 1-10 with distd. water | 4250 | 7.10 | 7.05 |

With endo-bouillon dild. 1-5 the values obtained were, electrometrically, 7.5; neutral red, 7.5; phenol red, 7.3.

A. W. DOX

Changes in the nitrogen-containing substances at the terminal phases of yeast autolysis. NICOLAUS N. IVANOV. Univ. St. Petersburg. *Biochem. Z.* **120**, 1-24 (1921).—If, when the protein decompn. which takes place during the autolysis of yeast reaches a certain limit, the soln. is made alk. and the autolysis continued, an increase in the protein N as detd. according to the Stutzer's Cu hydroxide pptn. method is found. This increase takes place at the expense of that fraction of the original protein decompn. products which is pptd. by phosphotungstic acid and Pb acetate; only an insignificant amt. of NH_2 N accompanies it. On the other hand after peptase has acted for some time during the yeast autolysis at higher temp. and in an alk. soln. a decrease in the NH_2 N takes place, which is not accompanied by any increase in N pptd. by Stutzer's method. The diminution of the NH_2 groups under these conditions is not the result of a contingent desamination and is not accompanied by a decrease in the COOH of some particularly stable compds. This tying up of the NH_2 groups is explained by the formation of compds. of the humin type from the NH_2 acids of the autolyzate and the traces of sugar which remain from the autolysis. This is considered of fundamental importance.

F. S. HAMMETT

Protein decomposition in yeast during fermentation. NICOLAUS N. IVANOV. Univ. St. Petersburg. *Biochem. Z.* **120**, 25-61 (1921).—The results of these extensively detailed expts. show that protein decompn. takes place during the fermentation of sugar. Earlier reports as to the stability of protein during this process are to be referred to the incompleteness of the Stutzer method for the detn. of protein. During the fermentation, but independently of it, there takes place an increase in N-contg. substances which, however, have no protein characters and which are pptd. by Cu hydroxide. This marks the protein decompn. The non-protein nitrogenous substances which are formed during fermentation resemble humin substances in their properties and structure. Substances of the humin type are not split off by the proteolytic enzymes of the yeast, wherefore they cannot serve as N-contg. nutrients during yeast development. Mayer's (Agrik. chem. Gärungschem., Heidelberg, 1902) fermentation excretory products are compds. of the humin type formed from the freed N-contg. yeast substances and sugar.

F. S. HAMMETT

The influence of the products of fermentation on the decomposition of the protein materials in yeast. NICOLAUS N. IVANOV. Univ. of St. Petersburg. *Biochem. Z.* **120**, 62-80 (1921).—I. presents in this paper evidence which confirms the results of earlier workers as to the presence in fermenting liquids of substances which are formed during fermentation and which retard protein decompn. The addition of NaH_2PO_4 to

the fermentation liquid under the conditions of the expts. reported did not accelerate the decompn. of the yeast proteins, if the yeast had been previously killed and then autolyzed. If living yeast is killed and is then autolyzed after having added to it in the one case the products of fermentation, in the other an amt. of EtOH which makes the EtOH concn. equiv. to that of the fermentation products, it is found that the latter retard the protein decompn. on account of their acid reaction to a greater degree than does the EtOH. Moreover these products of fermentation markedly retard the protein decompn. in hefanol. This does not occur when the neutralized products are added or their distillate or EtOH of the same concn. On the other hand these products of fermentation exert no action on dry yeast, but protein decompn. is retarded if the products are distd., or if equimol. vols. of EtOH are added. These differences in reaction are attributed to differences in physiol. condition and response to the H-ion concn. The addition of 7% EtOH inhibits protein decompn. in dry yeast to a marked degree, but this effect is removed by KH_2PO_4 soln. It thus appears to the author as if EtOH is the main factor in the inhibition of the protein decompn. which effect is frequently marked by the similar action of the acid reaction of the yeast products. F. S. H.

Theory of disinfection. I. A. TRAUBE AND R. SOMOGYI. Techn. Hochschule Charlottenburg. *Biochem. Z.* **120**, 90-9 (1921); cf. *Biochem. Z.* **98**, 197 (1919) and *C. A.* **14**, 2515.—As subjects for this study there were used the Gram-positive staphylococcus and the Gram-negative strains of *B. coli*. Emulsions of these organisms from agar slant cultures were treated with a large series of bactericidal agents both org. and inorg. and record was made of the concn. of effective material which would completely kill the bacteria. This bactericidal activity was correlated with the surface tension of the substances tested as detd. by the capillarimeter and the viscostagometer. It was found that although the H-ion concn. is a participating factor it is by no means the only significant factor. Nevertheless, surface-active combination is only effective when the union is of an acidic or basic character in which the compds. form salts yielding anions or cations. The observations show that *B. coli* is less resistant to basic compds. than is the staphylococcus and that the latter is more sensitive to acidic substances than is *B. coli*. This and preceding studies lead to the conclusion that a strictly chem. interpretation of disinfection is unjustified and that the phenomenon should be attributed to physical effects such as surface forces, adsorption, elec. potential, swelling, flocculation and osmotic phenomena. F. S. HAMMETT

The action of acids on yeast fermentation. R. SOMOGYI. Techn. Hochschule Charlottenburg. *Biochem. Z.* **120**, 100-2 (1921).—S. detd. the effect of various concns. of HCl , HNO_3 , H_2SO_4 , $(\text{COOH})_2$, H_3PO_4 , tartaric acid, lactic acid, CH_3CICOOH , CH_3COOH , HCOOH , isobutyric acid, isovaleric acid and caprylic acid on the fermentation activity of yeast on a 10% glucose soln. at room temp. Studies were also made of the fermentation inhibitory action of isoamyl alc., heptyl alc., and tertiary amyl alc. The results as a whole indicate that the harmful effects of acids cannot be attributed to the H-ion concn. alone but that their surface tension, and their swelling and flocculating properties must be taken into account. F. S. HAMMETT

The action of salts on the decolorization of methylene blue by various kinds of yeast. H. KUMAGAWA. Tokyo. *Biochem. Z.* **121**, 150-63 (1921).—A report is made of the effect of a long list of salts in various concns. on the decolorization activity of yeast on methylene blue. Neither Ca nor Zn salts showed any specific retarding or accelerating influence, though in some cases inhibition was obtained. CuSO_4 and HgCl_2 inhibit the reaction without exception, while Pb , Fe and U salts may act as retardants. The effect seemed in part to be related to the amt. of H_2O present. The reduction capacity in general did not vary from one strain to the other for much individual variability was found. Hence the opinion is expressed that the differences in

the reactivity of the different yeasts both in the presence and in the absence of metallic salts is due to the respective physiological condition of the specimens used. This is probably a question of nutrition, rather than any relation with the zymatic enzyme.

F. S. HAMMETT

Lipase from *Aspergillus niger*, van Tiegh. ROBERT SCHENKER. Univ. Basel. *Biochem. Z.* 120, 164-96(1921).—Results are reported of a study of the action of *Aspergillus niger* on various fats, in which the detn. of the lipase activity was made by titration with KOH of the fatty acids produced. It is shown that the lipase activity of the plant enables it to utilize the C of fats for its own C need when no other C source is present. The temp. curve for growth and lipase activity are nearly parallel. The reaction of the substrate plays an important part in the process, for weak acidity favors while alkalinity retards the fat splitting. Although *Aspergillus* can and does form lipase on many different kinds of substrates it appears that a medium which contains fat is particularly stimulating to lipase formation. Sucrose and other sugars apparently retard lipase formation while N compds., such as peptone, have no effect. Oxalic acid was found to occur as the result of the growth of *Aspergillus* whether fat was present or not. The enzyme is destroyed by dry heat and splits mono- and tributyrin easily at the optimum temp. of 40°.

F. S. HAMMETT

The decomposition of *d*-galactose according to the second type of fermentation. M. TOMITA. Kaiser Wilhelm Inst. Exptl. Therap. in Berlin—Dahlem. *Biochem. Z.* 121, 164-6(1921).—Nine g. of *d*-galactose were dissolved in 50 cc. of Neuberg-Reinfurth's nutritive medium and 9 g. of yeast were added. After a preliminary period of fermentation 6 g. of Na₂SO₃ in 50 cc. of water were added. The mixt. was allowed to stand for 8 days. It then gave a positive test for acetaldehyde. The acetaldehyde present was 8.64%. In another expt. twice the amt. of yeast was added. In this case 10.54% of aldehyde was found. In a third expt., with larger quantities of all the reagents, there was produced 8.50% of acetaldehyde and 17.42% of glycerol. These proportions indicate that *d*-galactose undergoes a true acetaldehyde-glycerol decompn. by yeast, as do the 3 other fermentable sugars.

F. S. HAMMETT

The destruction of *l*-tryptophan by proteus bacteria. TAKAOKI SASAKI AND ICHIRO OTSUKA. Tokyo. *Biochem. Z.* 121, 167-70(1921).—Two g. of *l*-tryptophan from casein was put in 4 sterile flasks with 890 cc. of a nutrient medium made of KCl 1 g., NH₄Cl 1 g., MgSO₄ 0.1 g., glycerol 25 g. and 170 cc. of Henderson's phosphate mixt. dild. to 1 l. to which 0.5 g. freshly pptd. uranyl phosphate was added. This was incubated with a suspension of 24-hr.-old proteus agar cultures obtained from pancreatic digestion for 44 days. At this time the tryptophan reaction was negative. From this there was isolated by basic Cu acetate pptn. and purified by H₂S and petroleum ether pptn. a compd. melting at 98-99°, which on analysis was shown to be *d*-indole-lactic acid, $[\alpha]_D^{16} -5.84^\circ$.

F. S. H.

Synthesis of vitamine B by yeasts (preliminary note). ARTHUR HARDEN AND S. S. ZILVA. Lister Inst. *Biochem. J.* 15, 438-9(1921).—(Cf. Nelson, Fulmer and Cessena, *C. A.* 15, 2465). Is yeast grown on a medium devoid of vitamine B able to produce this substance? H. and Z. grew the yeast on a synthetic medium contg. NH₄ phosphate and NH₄ chloride as sources of N, together with the necessary mineral salts and cane sugar which was fractionally pptd. by alc. from aq. soln. and the soln. of the dried purified material then shaken 3 times with fuller's earth to remove any possible traces of vitamine B. The specimen *S. cerevisiae* used had been isolated from a sample of Baker's yeast, and *S. ellipsoideus* was also examd. The former grew very slowly and imperfectly in the medium, whereas the latter grew more rapidly and gave a much larger yield. The yeasts were centrifuged out of the medium, washed three times with distd. water, pressed and dried in air. A parallel culture of *S. ellipsoideus* on unhopped brew-

er's wort was made and the yeast crop treated similarly. The dried yeasts were then compared as regards their curative effect on pigeons suffering from avian polyneuritis as a result of diet of polished rice, and showing retracted neck. The expts. show that *S. ellipsoideus* produces vitamine B, and that the yeasts grown on the synthetic medium contain vitamine B, but not in so large a proportion as those grown on wort. Further expts. are in progress.

BENJAMIN HARROW

The change in the hydrogen-ion concentration of various mediums during heating in soft- and pyrex-glass tubes. J. R. ESTY AND P. H. CATHCART. Washington, D. C. *J. Infect. Dis.* 29, 29-39(1921).—Heating unbuffered solns. in soft-glass tubes greatly affects the H-ion concn. Heating mixts. of Na_2HPO_4 and K_2HPO_4 in hard-glass tubes does not affect the H-ion concn. during the heating, while prolonged heating in soft-glass tubes dissolves out alkali in excess of the amt. which can be controlled by the buffer salts. Heating in soft glass causes a greater lowering in the H-ion concn. of an alk. soln. of this mixt. than in acid solns. A neutral soln. does not change appreciably during heating even in soft-glass tubes. Heating the juices pressed from canned corn, peas, string beans, spinach, beets, sweet potatoes, and pumpkin in soft-glass tubes affects the H-ion concn. less than in hard-glass tubes. A longer time is necessary to destroy the same suspension of spores in corn juice if heated in soft-glass tubes than in hard-glass tubes. No general statement can be made regarding the relative merits of hard- and soft-glass tubes in the detn. of the thermal death point. The type of glass to be used for this purpose must be detd. for each soln. In thermal death-point detns. the H-ion concn. of the soln. must be known during the entire period of heating. J. H. L.

The amount of heat liberated by *Bacillus coli* when grown in the presence of free amino acids. C. SHEARER. *J. Physiol.* 55, 50-60(1921).—When *B. coli* are grown in a tryptic digest mixt. the amt. of heat liberated is only 12 to 33% of that evolved by a similar culture on dextrose-peptone broth. The process of building amino acids into the living protoplasm of *B. coli* appears, therefore, to be an extremely economical one. In the fermentation of dextrose only about 1% of the available energy of the dextrose used appears as heat. Pathological growth is less economical of energy than normal.

J. F. LYMAN

The oxidation of sulfur by microorganisms. S. A. WAKSMAN AND J. S. JOFFE. N. J. Agr. Expt. Sta. *Proc. Soc. Exptl. Biol. Med.* 18, 1-3(1920); cf. *C. A.* 15, 1332.—Another group (5) of S-oxidizing bacteria was isolated and studied; it comprises bacteria similar to group 4 in morphology, but smaller (less than 1 μ in length) and different physiologically. They do not act upon thiosulfate and H_2S , only upon elementary S, and they allow the medium to become acid up to a $p\text{H}$ of 0.8-1.2, by the rapid production of H_2SO_4 , which transforms insol. $\text{Ca}_3(\text{PO}_4)_2$ into sol. PO_4 and H_2PO_4 . The organisms were isolated from composts consisting of S, phosphate rock and soil, where S oxidation is very strong; they do not need any org. substances for their development, the C being derived from the CO_2 of the air.

V. C. MYERS

Observations on bacterial metabolism. J. H. MUELLER. Col. Phys. and Surg. N. Y. *Proc. Soc. Exptl. Biol. Med.* 18, 14-17(1920).—Data are presented which indicate that casein and certain other proteins contain a hitherto undescribed component, which also occurs in an infusion of beef and beef heart. It is essential to the growth of the hemolytic streptococcus and probably the pneumococcus, and is absorbed from the beef infusion by charcoal, and ptd. from the casein in an impure form by HgSO_4 . The chem. nature of the substance has not yet been detd.

V. C. MYERS

Further studies on intestinal implantation of *Bacillus acidophilus*. H. A. CHEPLIN AND L. F. RETTER. Yale Univ. *Proc. Soc. Exptl. Biol. Med.* 18, 30-2(1920); cf. *C. A.* 15, 2466.—Further data confirm earlier observations that lactose, dextrin, *B. acidophilus* cultures, and *B. acidophilus* milk, when fed in sufficient amts., transform

the intestinal flora into acid-forming types, chiefly *B. acidophilus*. Special care should be used in prep^g. the *B. acidophilus* milk to produce a uniform product of proper quality.

V. C. MYERS

The viability of *Bacillus typhosus* in alkaline bile in vivo. T. D. BECKWITH. Univ. Calif. *Proc. Soc. Expl. Biol. Med.* **18**, 36-8(1920).—Bile from carrier rabbits of *B. typhosus* shows a lower H⁺ concn. (8.33) than that from normal animals (7.41). *B. typhosus* is viable *in vivo* in rabbit bile even when the H⁺ concn. is depressed to *p*_B 9.4.

V. C. MYERS

On certain poisonous substances produced in bacterial cultures. H. ZINSSER, J. T. PARKER AND A. KUTTNER. Col. Phys. Surg. N. Y. *Proc. Soc. Expl. Biol. Med.* **18**, 49-56(1920).—In working with a number of different organisms, poisonous substances of moderate potency have been found to develop on fluid and on solid media which should not be regarded, at present, either as sp. or antigenic exotoxins, or as endotoxins. It has not yet been possible to classify these substances definitely. V. C. M.

Concerning toxic by-products of *Bacillus botulinus*. J. BRONFENBRENNER, M. J. SCHLESINGER AND P. F. ORR. Harvard Med. Sch. *Proc. Soc. Expl. Biol. Med.* **18**, 181-2(1921).—When *B. botulinus* is grown on suitable medium there are produced, in addition to the sp. toxin, other poisonous products. These are not neutralized by the sp. *botulinus* antitoxin. They are dialyzable, act only in very large amounts, and exert their action immediately upon injection and not after a period of incubation characteristic of bacterial toxins; they are thermostable and are not destroyed when heated in a sealed tube; in the open container their toxicity diminishes. They are chem. by-products of the bacterial metabolism. V. C. MYERS

Growth accessory substances in the nutrition of bacteria. T. THJÖTTA AND O. T. AVERY. Hosp. Rockefeller Inst. *Proc. Soc. Expl. Biol. Med.* **18**, 197-9(1921).—*B. influenzae* will grow in blood-free broth contg. exts. of heat-killed bacilli; it will also grow when transplanted from blood medium to plain broth contg. yeast ext., although cultivation cannot be continued more than 1 or 2 transfers in yeast broth alone. Some substance in the blood culture is essential to growth in addition to the vitamin-like substance in the yeast ext. V. C. MYERS

The influence of tissue enzymes on the bacteriophage principle. A. G. KUTTNER. Columbia Univ. *Proc. Soc. Expl. Biol. Med.* **18**, 222-5(1921).—Lysis of typhoid bacilli transmittable in series has been obtained by the action of glycerol exts. of small intestine and CHCl₃ or NaF exts. of the liver of normal guinea pigs. Glycerol exts. of the large intestine and of muscle tissue have given negative results. V. C. MYERS

Growth-determining substances in bacteriological culture media. J. H. MUELLER. Columbia Univ. *Proc. Soc. Expl. Biol. Med.* **18**, 225-8(1921).—While a peptone-free meat infusion broth will produce growth of hemolytic streptococci, short boiling with charcoal removes this property. It can be reactivated by addition of com. peptone or an acid hydrolyzate of casein or meat. From chem. sepn. tests there appear to be 3 factors, still unidentified, which det. growth. V. C. MYERS

Rapid physiologic mutations in the lactic enzymes by individual divergences. C. GORINI. *Compt. rend.* **172**, 1382-4(1921).—G. observed that normally lactic-proteolytic enzymes at first coagulated milk, then redissolved the curd. Rarely, a certain variety of enzyme peptonized acid milk but without previous coagulation, and this variety appeared capable of hereditary transmission in the enzyme cultures. Such an enzyme acted in an abatement of acid concn. from whence the defective coagulation preceded peptonization. Cases of retrmutation, that is, of a sudden return of this property after several generations of normal activity, were noted. The biological significance of these findings is discussed with particular reference to the work of Charles Richet.

L. W. RIGGS

Process of individual diagnosis of the blood and of the sperm. DERVIEUX. *Compt. rend.* **172**, 1384-6 (1921).—A rabbit on each of 3 days received 5 subcutaneous injections of 2 cc. each of pure human sperm contg. live spermatozoids. At the end of 3 weeks the rabbit was bled from the carotid, the serum aseptically collected and preserved in sealed ampoules. Serum thus prep'd. gave a ppt. with human sperm but not with sperm of other animals. It has toward the original sperm a pptg. power much greater than toward sperm of other origin. It gives a ppt. with greatly dild. human blood while rabbit serum prep'd. by injections of human blood gives ppt. only in much greater concns. It gives ppt. with man's blood in much greater dilns. than with woman's blood, and gives a much more intense reaction with blood from the same individual as the sperm, than with blood from a different individual. The specificity of these pptn. reactions is of value in solving various diagnostic questions. L. W. RIGGS

Differentiation of type A and type B botulinus toxins in food. ROBERT GRAHAM AND HERMAN SCHWARZE. *J. Am. Med. Assoc.* **76**, 1743-4 (1921).—Unfiltered toxic broth cultures of *B. botulinus*, types *A* and *B*, when fed to sep. groups of chickens, repeatedly suggest that these fowls are susceptible to type *A* toxin, yet are highly refractory to type *B* toxin. "The result of bacteriologic studies of sporadic cases of so-called limber neck in poultry, unassociated with botulism in other species, suggests that *B. botulinus*, type *A*, may be associated with avian botulism, exclusive of *B. botulinus*, type *B*." Repeated trials with different strains of type *B* failed to induce symptoms of illness in chickens, but the toxicity of the type *B* strains was established in guinea pigs, wherein 0.000001 cc. of some strains proved fatal. The positive value of this test in chickens is limited to the recognition of type *A* toxin, which if present is manifest in a general paresis and coma in a few hrs. L. W. RIGGS

Growth of influenza bacilli without blood. T. M. RIVERS. *J. Am. Med. Assoc.* **76**, 1744-5 (1921).—Into 250 cc. of 2% Fairchild's peptone water, $p_{H_2} 7.6$, 3 eggs were stirred, boiled 1 min., filtered through cotton, and autoclaved in 100-cc. quantities for 15 min. under 15 lbs. pressure. On removal from the autoclave there was a large amt. of a fluffy ppt. present which was allowed to remain, because if it was filtered out, growth was not supported for many generations. To each 100 cc. of autoclaved egg infusion broth were added from 10 to 20 cc. of a filter-sterilized yeast ext., and this mixt. was tubed in 10-cc. quantities under sterile conditions. The medium was incubated 48 hrs. to insure sterility. The first inoculation was made with a loop of influenza bacilli from a blood agar slant. Subsequent transplants were made daily with a pipet, 0.5 cc. of the culture being carried over each time. "A heavy growth was obtained for the first 2 or 3 generations, and then only a light one for 8, 10, and 15 generations." The cultures were plated on blood agar frequently and were always found pure, yielding from 100 to 300 colonies from each loop. To avoid the possible introduction of blood deriv. a medium of the following compn. was substituted for the peptone water: Glycerol 30 g., NaCl 5, CaCl₂ 0.1, MgSO₄ 0.2, K₂HPO₄ 2, NH₄C₂H₅O₂ 12, asparagine 0.5, tryptophan 2.5, distd. water 1000. This medium was titrated to p_{H_2} 7.4 and autoclaved in 100-cc. quantities. Eggs and yeast were added as desired. As the bacilli were grown in the absence of peptone, the presence of the hemophilic or hemoglobinophilic factor appears unnecessary. L. W. RIGGS

Separation of tetanus antitoxin from associated protein. W. N. BERG. *J. Am. Med. Assoc.* **76**, 1820 (1921); (cf. Huntoon, Masucci and Hannum, *C. A.* **15**, 1563).—A study of the action of pepsin-HCl and of trypsin-Na₂CO₃ solns. on tetanus antitoxin did not yield a soln. contg. the antitoxin and free from protein, but did yield solns. of antitoxin in 0.2% HCl or 0.5% Na₂CO₃, which on standing showed complete loss of antitoxic units, although the total coagulable protein content remained unaltered. As the result of chem. analyses and inoculation tests on 440 guinea pigs by the official

method (cf. Rosenau, *C. A.* 2, 3369) the following conclusions were reached: Tetanus antitoxin in 0.5% Na_2CO_3 soln. was slowly and completely destroyed. At the same time no significant chem. changes in the proteins were detected. In solns. amphoteric or faintly acid to litmus paper, trypsin destroyed the antitoxin, and at the same time the associated proteins were digested. The rates of antitoxin destruction and protein splitting were substantially the same. The results were the same with solns. contg. trypsin and 0.5% Na_2CO_3 . Tetanus antitoxin in 0.2% HCl was completely destroyed in 3 or more days. During this time no significant chem. changes in the proteins were detected. In neutral solns. pepsin did not affect the antitoxin. In pepsin-HCl, proteolysis and antitoxin destruction proceeded simultaneously. These results tend to indicate that tetanus antitoxin is a substance of nonprotein nature. But the stability of the antitoxin is so dependent on that of the protein to which it is attached that, whenever the protein mol. is split, the antitoxin splits with it. L. W. RIGGS

Precipitation of sera by bacteria and the general serologic significance of the phenomenon. HERMANN DOLD. *Med. Klin.* 17, 48-51(1921).—The pptn. of sera by bacteria is not a phenomenon sp. to the production of anaphylatoxin but is a process of general importance, occurring in such reactions as agglutination, bacteriolysis, complement inactivation by bacteria, complement fixation by bacterial antigens, and opsonization. In normal agglutination a certain labile portion of the serum globulin is thrown out of soln. and the ppt. is composed not only of bacterial cells but of ptd. serum globulin as well. In the bacteriolytic reaction a pptn. of the serum globulin is primary phase of the reaction. In all forms of complement inactivation, by bacteria, by cobra venom, by deficiency in electrolyte, or by fixation, the phenomenon is a pptn. of the globulins. In the opsonic reaction the interaction between the globulin and the bacterial surface leads to alterations in the chemotactic forces operating between bacterium and leucocyte. G. H. S.

Chemotherapeutic experiments on wound diphtheria. L. FRANZ. *Med. Klin.* 17, 107-8(1921).—Although antitoxin may result in neutralization of the toxins absorbed from a wound infected with *B. diphtheriae* it is of questionable value in eliminating the organisms from the lesion. Various chem. compds. which have been, or might be, employed in direct chemotherapy, were tested *in vitro* for their antiseptic and disinfecting properties. Inhibition of growth (24 hr. exposure) was effected by the following compds. in the concn. noted: methylene blue, 1: 400,000; Ag-methylene blue (argochrome), 1: 128,000; crystal violet, 1: 800,000; 3,6-diaminoacridine chloride, 1:128,000; trypaflavine, 1:256,000; argoflavine, 1: 1,000,000; optochin, 1: 8,000; eucupine 1:64,000; vuzin, 1: 256,000. In the detns. of actual disinfecting power the derivs. of acridine and hydrocupreine were particularly efficient. G. H. S.

Two new alumina preparations and their antibacterial action. PIORKOWSKI. *Med. Klin.* 17, 782-3(1921).—The bactericidal action of two compds. (a) an alumina prepns. contg. Ca, lactic and tartaric acids; and (b) a combination of alumina, lactic and tartaric acids and Na perborate was detd. upon staphylococci, streptococci and *B. coli*. Both compds. showed considerable bactericidal power as well as a growth-inhibiting activity. G. H. S.

Studies on bacterial nutrition. I. Growth of *Bacillus influenzae* in hemoglobin-free media. THEODOR THJÖTTA. Rockefeller Inst., Med. Research. *J. Exp. Med.* 33, 763-71(1921).—*B. influenzae* will grow profusely in hemoglobin-free media consisting only of plain broth and emulsions or exts. of mucoid bacilli and *B. proteus*. The emulsions and the exts. can be boiled and filtered through Berkefeld filters without losing their growth-inducing property. This effect of bacterial exts. is possibly due to substances belonging to the so-called vitamines. **II. Growth accessory substances in the cultivation of hemophilic bacilli.** THEODOR THJÖTTA AND O. T. AVERY. *Ibid.*

34, 97-114.—The hemophilic bacteria, of which *Bacillus influenzae* serves as a type, required for their growth 2 distinct and separable substances, both of which are present in blood and neither of which alone suffices. These are: a vitamine-like substance which can be extd. from red blood corpuscles, from yeast, and from vegetable cells, which is relatively heat labile and absorbed from soln. by certain agents; a so-called X substance which is present in red blood cells, is heat stable and acts in minute amts. C. J. W.

Lactic fermentation (KAYSER) 12. Influence of fermentation products of bacteria on corrosion in condensers (GRANT, *et al.*) 9.

D—BOTANY

CARL L. ALSBERG

Relation of catalase, oxidase, and hydrogen-ion concentration to the formation of overgrowths. R. B. HARVEY. *Am. J. Botany* 7, 211-21(1920).—A comparative study of normal tissues of plants and tumor tissues produced by *Bacterium tumefaciens* shows certain chem. differences. Ricinus and beets are the principal plants studied. No significant difference is found in osmotic concn. as detd. by a thermocouple or by f. p. The greater significance is attached to detns. by a thermocouple. Juices expressed from tumor tissue showed consistently a little lower H-ion concn. than those from healthy stem tissue. The activity of oxidase and catalase is considerably greater in tumorous than in healthy tissue. It is suggested that this may be due to the lower H-ion content. The tumorous tissue produced by *B. tumefaciens* was essentially the same as that produced by freezing.

M. S. ANDERSON

Effect of ammonium sulfate upon plants in nutrient solutions supplied with ferric phosphate and ferrous sulfate as sources of iron. LINUS H. JONES AND JOHN W. SHIVE. N. J. Agr. Expt. Sta. *J. Agr. Research* 21, 701-28(1921); cf. *C. A.* 15, 1153.—The effects of $(\text{NH}_4)_2\text{SO}_4$ in nutrient solns. upon the growth of young wheat plants and its influence upon the ability of the plants to utilize Fe from a sol. Fe^{2+} and an insol Fe^{3+} salt were studied. A study of the change in reaction of the nutrient solns. induced by contact with the plant roots was also made. Two series of culture solns. were used: the first comprised 20 solns. selected from the Tottingham series of 84 and the second series consisted of the same solns. modified by substituting $(\text{NH}_4)_2\text{SO}_4$ for the KNO_3 in equiv. osmotic concns. All the solns. had a total osmotic concn. value of approx. 1 atm. The sol. and insol. Fe in the form of FeSO_4 and FePO_4 , resp., was added to the solns. in quantities of 0.83 mg. of Fe per 1. of soln. The culture solns. were renewed at regular intervals of 3½ days throughout the entire growth period of 35 days. A description of the nutrient solns. used, the max. and minimum temps., the av. daily loss of H_2O by evapn. from standard white and black spherical atmometers and the character of the days during the exptl. periods are tabulated. The dry wts., yields of wheat tops and roots, the amts. of Fe supplied to each culture, also the p_{H} values and score of the yellowness of the leaves of the culture solns. are recorded. The H-ion concn. and the dry wts., the yields of wheat when Fe in the form of FeSO_4 was used, the vol.-molecular partial concns. and ranges for the salts in the solns. producing the 6 highest yields of tops and roots in both series are given. Some of the results are shown by graphs. The plants grown in the Tottingham solns. invariably produced a marked decrease in H-ion concn. of the solns., while in the early stages of growth in the $(\text{NH}_4)_2\text{SO}_4$ solns. an increase of H-ion concn. took place. The direction of the change in reaction of the culture solns. produced by the growing wheat plants was detd. by the nature of the salt constituents in the solns. FePO_4 , in the quantities used was not sufficiently available in the Tottingham solns. to supply the needs of the plants for Fe. The low yields produced by these solns. were correlated with a high degree of chlorosis and with high p_{H} values. On the other hand this form of Fe appears to be readily available to the plants in the

solns. contg. $(\text{NH}_4)_2\text{SO}_4$. The high yields produced by these solns. were associated with relatively low p_{H} values and the plants were free from chlorosis. FeSO_4 in the amts. used was sufficiently available in the Tottingham solns. to satisfy the needs of the plants for Fe. These solns. with the sol. form of Fe produced excellent growth and high yields and no chlorotic or toxic effects were apparent. The solns. contg. $(\text{NH}_4)_2\text{SO}_4$ with this form of Fe in quantities of more than 0.01 mg. of Fe per l. of nutrient soln. were very toxic to the plants, the degree of toxicity increasing with an increase in the amts. of Fe added to the solns. The nature of the nutrient solns. with respect to the salt constituents and H-ion concn. appears to det. the availability and the efficiency of a given Fe salt for plant growth. The 6 highest yields of wheat tops from the Tottingham series are correlated with relatively wide ranges in the proportions of all 4 salts employed. The 6 highest yields of tops from the series contg. $(\text{NH}_4)_2\text{SO}_4$ are associated with relatively wide ranges in the proportion of KH_2PO_4 , $\text{Ca}(\text{NO}_3)_2$ and MgSO_4 but with a narrow range in the proportion of $(\text{NH}_4)_2\text{SO}_4$. In the series of solns. contg. $(\text{NH}_4)_2\text{SO}_4$, high yields of tops were generally associated with high yields of roots; but no such correlation between tops and roots existed in the Tottingham series. F. C. C.

The action of neutral salts on the plasma of plants. II. HUGO KAHNO. Dorpat, Estland. *Biochem. Z.* 120, 125-42 (1921).—Studies are reported of the plasmolyzing effect on cells of red cabbage and *Tradescantia zebra* of a large series of salts. The results indicate in general that the coagulating effect on the plasma is dependent on both ions and has an additive character in which the anion is of more significance than the cation. The material is presented in such detail that it is unsuitable for abstracting.

F. S. HAMMETT

Leaf-tissue production and water content in a mutant race of *Phaseolus vulgaris*. J. A. HARRIS. *Bot. Gaz.* 72, 151-161 (1921); cf. *Science* 36, 713 (1912) and *C. A.* 7, 104.—"This paper presents the results of an investigation of green weight, dry weight, and of the ratio of green weight to dry weight in primordial leaf tissue in mutant and parental races of *Phaseolus vulgaris*. The data show that when grown under as nearly identical conditions as possible the primordial leaves of the mutant (tetracotyledonous) show a smaller green weight, a smaller dry weight, and a lower ratio of dry weight to green weight than those of normal (dicotyledonous) parental race. Thus the tetracotyledonous race is distinguished not merely by striking morphological difference, but by physiological differentiation as well. In this respect the results for the heritable mutant race are in agreement with those for variant individuals within the same strain."

BENJAMIN HARROW

The effects of yeast vitamine water-soluble B on plant cell masses and on biocolloids. D. T. MACDOUGAL. Desert Lab., Tucson, Ariz. *Proc. Soc. Exptl. Biol. Med.* 18, 85-7 (1920).—A soln. of H_2O -sol. B yeast vitamine at 0.1%, $p_{\text{H}} = 5.25$, causes a hydration in excess of that which may take place in H_2O in agar, agar and soap, agar-gelatin, agar-gelatin and salts, and in gelatin. Lessened hydration ensues in agar and salts, agar-gelatin and soap, gelatin and salts, and gelatin and soaps. Mature fruits, pith and joints of plants show excessive swelling in vitamine solns. Dried cell masses of roots and joints of *Opuntia* show excessive swelling in vitamine soln. Lessened hydration ensues in young tubers of potato and roots of corn, a result parallel to those obtained from mixture of agar, gelatin and soap. Increased hydration takes place in root tips of orange seedlings and of strawberry plants.

V. C. MYERS

Maximum values of osmotic concentration in plant tissue fluids. J. A. HARRIS, R. A. GORTNER, W. F. HOFMAN AND A. T. VALENTINE. Carnegie Sta. Exptl. Evolution and Univ. Minnesota. *Proc. Soc. Exptl. Biol. Med.* 18, 108-9 (1921); cf. *C. A.* 15, 1035, 1336.—Concns. measured by a f.-p. depression of 13.0°, presumably the equiv. of 153 atm., may be found in the tissue fluids of apparently normal leaves. V. C. M.

Effects of age and of the inclusion of salts on the heterotropic action of colloidal bodies of cytological interest. D. T. MACDOUGAL. *Desert Lab., Tucson, Ariz. Proc. Soc. Expl. Biol. Med.* **18**, 244–6 (1921).—The alterations in dimensional relations resultant from age, from the incorporation of salts (KCl, CaCl₂, HCl, NaCl, MgCl₂) in concns. within the range of occurrence in the cell, and from hydration in various solns. are to be included in the possibilities of conditions affecting growth and cytological structure.

V. C. MYERS

Discovery of sugar on Douglas fir. F. DICKIE. *Am. Forestry* **26**, 84–6 (1920); *Botan. Abstracts* **5**, 175.—In certain parts of the dry belt of British Columbia a manna is formed at the tips of the needles of the Douglas fir. It contains about 50% of the trisaccharide melezitose. As a succession of days of sunshine is required for its formation, the fir does not yield a harvest of manna that can be depended upon. T. G. P.

Anatomical and morphological research on var. *tuberosa* of *Arrhenatherum elatius* recently found in Piedmont. ALPHONSINA MONDINO. *Atti. accad. sci. Torino* **54**, 782–94 (1919). *Botan. Abstracts* **4**, 151.—The tuberous internodes of the rhizomes of this species contain a reserve carbohydrate, graminin, C₁₈H₃₀O₆, related to inulin. It occurs dissolved in the liquid of the leucoplasts and crystallizes in sphacrocryystals. It is insol. in EtOH, m. 209°, is levorotatory and yields fructose on hydrolysis.

T. G. PHILLIPS

Inheritance of sugar and starch characters in corn. R. A. HARPER. *Bull. Torrey Botan. Club* **47**, 137–86 (1920). *Botan. Abstracts* **5**, 201.—The dominance of starchiness is shown in the first cross, but in segregating generations, intermediate kernels, ranging from almost pure sweet to almost pure starchy, were obtained. There is a marked tendency for intermediate types to breed true, but with more of an inclination to revert to the sweet than to the starchy type.

T. G. PHILLIPS

The existence of free anthocyanidins in the fruits of *Ruscus aculeatus* and *Solanum dulcamara*. ST. JONESCO. *Compt. rend.* **173**, 168–71 (1921).—An acid ext. of the fruits of these species contains a color that is sol. in amyl alc. and is not washed out by H₂O. J. concludes that free anthocyanidins exist along with the anthocyanins in these fruits.

T. G. PHILLIPS

The condition of chlorophyll in the plastids. V. LUBIMENKO. *Compt. rend.* **173**, 365–7 (1921).—Chlorophyll may be extd. completely from leaves of *Aspidistra elatior*, by rubbing in a mortar with H₂O. After filtration through paper and asbestos, a stable clear, green soln. is obtained, which has the same absorption spectrum as the leaf itself. The chlorophyll is pptd. or changed by methods that coagulate proteins. If solns. of free chlorophyll in EtOH or MeOH are dild. with varying amts. of H₂O, crystals are formed whose structure varies with the extent of the diln. The action of the alcs. is much more complex than simple replacement of the phytol group. L. concludes that chlorophyll is chemically combined with proteins in the chloroplasts, that the chlorophylls of different species may differ, and that, in a single species, only one chlorophyll is present.

T. G. PHILLIPS

The formation of pearl glands in the Ampelidae. HEINRICH WALTER. *Flora* **14**, 187–231 (1921).—The accumulation of salts in the intercellular spaces near stomata together with the hydrolysis of starch in the cells causes the small swellings that are called pearl glands. The chlorophyll is destroyed and oil drops separate in the cells. These growths produce no secretion. They are favored by rapid growth, a good supply of soil moisture, and rapid evapn. None has been found that exceeds 2 mm. in diameter.

T. G. PHILLIPS

The rate of transfer of dissolved substances in the plant. LUISE BIRCH-HIRSCHFELD. *Jahrb. wiss. Botan.* **59**, 171–262 (1919); *Botan. Abstracts* **7**, 305–6.—Studies were made of the rate of conduction in various plants of solns. of LiNO₃, (NH₄)₂CO₃,

EtOH, methylene blue, eosin and other substances in the parenchyma of the cortex and in the phloem. The downward movement observed was much slower than the normal transpiration stream, but reached 1-10 cm. an hour when 1% LiNO_3 was used.

T. G. PHILLIPS

The influence of light on the growth and the absorption of nutrient salts by oats. H. WIESSMANN. *Landw. Jahrb.* 35, 183-90(1919); *Botan. Abstracts* 7, 317.—Oats grown on a roof and in a shaded court are contrasted. The former stooled better, had stronger stalks, blossomed and ripened earlier, yielded more of both grain and straw, and had taken up more N, P and K. The latter contained much the higher percentage of N, P and K.

T. G. PHILLIPS

Resistance of certain varieties of cultivated plants to parasites. C. BRICK *Naturw. Wochschr.* 18, 391-4(1919); *Botan. Abstracts* 7, 171-2.—Aside from morphological differences, and differences in the time of flowering or maturing, some varieties of plants are not attacked by parasites because of an increased content of acid and sugar or tannins.

T. G. PHILLIPS

A theory of geotropism; some experiments on the chemical reversal of geotropic response in stem and root. JAMES SMALL. *New Phytol.* 19, 49-63(1920); *Botan. Abstracts* 7, 202-3.—Geotropic response is caused by differences in permeability between the upper and lower cells of the bending organ. The protoplasm of roots is more acid than the isoelectric point of the amphoteric colloids present, that of the stem is less acid. Polarization is greater in the upper side of a cell; therefore, in roots an action current flows from the upper to the lower side of the perceptive region, having its max. effect on the under side of the root, and causing increased permeability. The situation is reversed in stems because the protoplasm is electronegative. Roots become negatively geotropic when grown in an atm. containing small amt. of NH_3 , and conversely, stems become positively geotropic when grown in an atm. contg. AcOH . T. G. PHILLIPS

Nature of hardening in vegetable plants. J. T. ROSA. *Proc. Am. Soc. Hort. Sci.* 16, 190-7(1920); *Botan. Abstracts* 7, 157.—The hardening of cabbage plants is accompanied by an increase in the % of dry wt. and a lowering of the f. p. of the cell sap. There is an accumulation of sugar, and also an increase in starch and total polysaccharides. Practices that check the rate of growth of cabbage, lettuce and tomatoes induce a greater degree of hardiness to cold.

T. G. PHILLIPS

Biology of the peronospore of the vine. E. PANTANELLI. *Rev. Patol. Veg.* 10, 51-72(1920); *Botan. Abstracts* 7, 290.—High humidity favors the attack of this fungus because the stomates are open, and because of its effect on the compn. of the leaves, causing them to contain a higher proportion of sol. carbohydrates, P and N. Young leaves are not often attacked because the stomates are closed, and because they contain little sugar, starch and sol. N compds.

T. G. PHILLIPS

Breeding the tea plant. C. P. COHEN STUART. *Z. Pflanzenzücht.* 7, 157-204 (1920); *Botan. Abstracts* 7, 266.—Some correlation seems to exist between the size of leaf tip and tannin content; at least only races with a tip over 9 mm. contain more than 15% tannin.

T. G. PHILLIPS

The relation of the hydrogen-ion concentration of nutrient solutions to growth and chlorosis of wheat plants. A. G. McCALL AND J. R. HAAG. *Soil Science* 12, 69-77(1921).—Wheat plants were grown for 2 months in 4 different nutrient solns., each of which was modified in such a way as to have 3 distinctly different pH values without materially altering the concn. of the six essential ions of the nutrient solns. The H-ion concn. influenced the growth rate. The plants grown in solns. with a pH of 4.2-7.0 suffered from chlorosis.

W. J. ROBBINS

How are gums formed in plants? ANON. *Farben-Ztg.* 26, 2415-6(1921).—A

very brief review of the various theories of the formation of gums. The author accepts the theory of von Wiesner that gum is produced in plants through an enzyme process.

F. A. WERTZ

Lignin and humin substances. K. G. JONAS. Breslau. *Z. angew. Chem.* 34, Aufsatzeil, 289-91 (1921).—The lignin prep'd. by Willstätter's method (*A*) is probably less changed than by any other method of prep'n. Chlorination, if carried out with careful cooling, always yields the same chloride. With 1% HCl, *A* is further hydrolyzed (*B*). HBr-AcOH completely demethylates the product. This product is no longer sol. in PhOH. The condensation product of *A* and PhOH, phenollignin (*b*), is an amorphous brown product, while *B* yields a phenollignin (*a*) which distils at 230-40° and 10 mm.; *a* is changed by KOH to an isomeric, much darker acid, from which a nearly colorless dihydro acid is obtained by reduction. On oxidation of α oxalic and picric acids are obtained. J. feels that no proof of the aromatic nature of lignin has yet been given. The natural humin substances probably have their origin in the hexoses. He does not agree with Fischer that lignin is the source of humin. C. J. WEST

Gelatinization of starch in cold water in presence of alkalies or neutral salts (REY-CHLAR) 2.

E—NUTRITION

PHILIP B. HAWK

NORMAL

Blockade and internal secretion. E. SEHRT. *Münch. med. Wochschr.* 68, 268-70 (1921).—The I content of the sheep thyroid in the last years in Germany was very small. Ext. of adrenal glands of animals did not contain any epinephrine. S. AMBERG

Some urinary changes in normal individuals on the pellagra-producing experimental diet. M. X. SULLIVAN. U. S. Pub. Health Service. *Arch. Intern. Med.* 28, 119-23 (1921).—Six normal people (5 men, 1 woman) were placed on a diet similar to that employed by Goldberger (*C. A.* 10, 1885) for the exptl. production of pellagra. An accident caused the discontinuance of the expt. after 4 or 5 days. Analyses of the urine showed that "The av. vol. decreased; the total N and urea N decreased markedly, the urea N especially; the NH₃ decreased slightly. The ratio of urea N to total N was markedly lowered, the NH₃ ratio increased. The findings recorded for the fourth day on the diet are comparable to those which obtain in the urine of pellagra patients in the active stages of the disease (*C. A.* 15, 1919) especially for total N, urea and, to a degree, for NH₃, and are such as would obtain on a low protein diet as found by Folin." I. GREENWALD

Vitamine studies. VIII. The effect of heat and oxidation upon the antiscorbutic vitamine. R. ADAMS DUTCHER, H. M. HARSHAW AND J. S. HALL. Univ. Minnesota. *J. Biol. Chem.* 47, 483-8 (1921); cf. *C. A.* 15, 550.—By using guinea pigs kept on a diet of 60% unhulled oats and 40% chopped alfalfa hay, previously autoclaved at 15 lbs. for 30 min., as the subjects and feeding them daily 3 cc. orange juice, mixed with 0.1 vol. H₂O or 3.5% H₂O₂, and subjected to varying treatment, it was found that the antiscorbutic action of the orange juice dild. with H₂O was not destroyed by heating for 30 min. to 63° in closed vessels or to boiling under reflux condenser. The orange juice that had been mixed with H₂O₂ was made less effective as an antiscorbutic and the destructive effect was markedly increased when the mixt. was heated to 63° or to 100°. I. G.

Animal calorimetry. XVII. The influence of colloidal iron on the basal metabolism. EINAR LANGFELDT. Cornell Univ. Med. College. *J. Biol. Chem.* 47, 557-63 (1921); cf. *C. A.* 14, 557.—The intravenous injection of 5 cc. colloidal Fe into dogs weighing about 9.4 kg. caused an increase in the heat production of 7% in one dog and 15% in the other. The respiratory quotient was slightly increased, as was the excretion

of N in the urine, but the chief increase in total heat production was due to an increased non-protein metabolism.

I. GREENWALD

The use of cottonseed to increase the percentage of fat in milk. ANDREW C. McCANDLISH. Iowa Agr. Expt. Sta. *J. Dairy Sci.* 4, 310-33(1921).—Expts. were undertaken to increase the fat content of milk temporarily by replacing certain constituents of the grain ration with cottonseed meal. The substitution of cottonseed meal for old process linseed oil meal and bran produced no marked change in % of fat but tended to cause increase when replacing cracked corn. All cows are not uniform in their reaction to cottonseed meal; some will lose appetite, be subject to digestive disturbances, and to decrease markedly in production of milk if a limited amount of meal is used in ration. The large decrease in milk production is accompanied by a high % fat. Increases in fat due to sudden administration of cottonseed meal take place in a comparatively short time and are not of long duration. The readministration of the meal before the cows recovered from the effects of the first administration tended to decrease rather than increase the fat content of the milk. The literature on this and other high protein foods is reviewed and 60 references are given.

H. A. LEPPER

Antineuritic vitamine in skim milk powder. J. M. JOHNSON AND C. W. HOOFER. U. S. Public Health Service. *Public Health Repts.* 36, 2037-43(1921).—The amt. of skim milk powder (spray process) required completely to protect pigeons on a diet of polished rice from polyneuritis was found to correspond to about 75 cc. of liquid milk daily, an amt. comparable to the quantity of fresh milk required (Gibson and Concepcion, *Philippine J. Sci.* 11 (B), 119(1918)) for complete protection. The process of drying skim milk does not lead to an appreciable destruction of the antineuritic vitamine.

H. B. LEWIS

The growth-promoting properties of milk and dried milk preparations. J. M. JOHNSON. U. S. Public Health Service. *Public Health Repts.* 36, 2044-57(1921); cf. preceding abstract.—The spray process of drying skim milk did not alter the content of the water-sol. vitamine as evidenced by the growth of white rats when skim milk powder, water, and butter fat were added to a basal diet (see below), in comparison with fresh or pasteurized milk. Excessive amts. of liquid milk (3.5 parts to 1 part of a basal diet contg. casein, starch, salt mixt., lard, butter, and agar) gave subnormal growth after a time, owing to the high amt. of liquid in proportion to the solids. For albino rats, at least 2.5 parts of milk to 1 part of the basal diet were found necessary to supply water-sol. vitamine and promote normal growth. This is in agreement with the work of Osborne and Mendel (*C. A.* 12, 1657) in which the daily requirement of fresh milk was found to be 16 cc.

H. B. LEWIS

The law of surface area in energy metabolism. J. R. MURLIN. *Science* 54, 196-200(1921).—A critical examn. of the relative values of surface area and body wt. as measures of body metabolism. Cf. Harris and Benedict, *C. A.* 13, 1221, 1722; Benedict and Talbot, *C. A.* 15, 2474.

H. B. LEWIS

Bibliography of the vitamines. ALBERT JACQUES JOSEPH VANDEVELDE. *Bull. inst. fermentations Gard* 29, 241-60(1920).

ALBERT R. MERZ

Preliminary experiments with the fat-soluble vitamine (vitamine A). H. C. SHERMAN, F. L. MACLEOD AND M. M. KRAMER. Columbia Univ. *Proc. Soc. Exptl. Biol. Med.* 18, 41-3(1920).—Skimmed milk contains about half as much fat-sol. vitamine as whole milk, according to results of feeding expts. Fat-sol. vitamine is essential to growth and has quite as striking an influence on reproduction. A surplus of this vitamine above immediate needs of growth or maintenance may be largely stored in the body and used later, to meet the needs of reproduction and lactation, or to carry the animal over a period of subsistence upon foods deficient in this vitamine. Dry heating at 100° with free access of air only very slowly destroys fat-sol. vitamine.

V. C. M.

Differential survival of male and female dove embryos in increased and decreased pressures of oxygen: A test of the metabolic theory of sex. O. RIDDLE. Carnegie Sta. Exp. Evolution. *Proc. Soc. Exptl. Biol. Med.* **18**, 88-91(1920).—Evidence is presented to show that sex is a factor in survival, and that it is the males which best survive increased O pressures and females which best survive decreased pressures and cooling. V. C. M.

Does growth require preformed carbohydrate in the diet? T. B. OSBORNE AND L. B. MENDEL. Yale Univ. *Proc. Soc. Exptl. Biol. Med.* **18**, 136-7(1921).—Rats receiving a diet in which the amt. of digestible carbohydrate was at most exceedingly small can grow from an early age to adult size. The rations included protein, casein, edestin, or extd. lean beef, inorg. salts, agar-agar, lard, butter fat and 0.4 g. daily of dried yeast furnishing vitamine B. Agar-agar was not necessary for such growth. V. C. M.

The antiscorbutic property of raw, dried and cooked apples and bananas. M. H. GIVENS, H. B. McCUGAGE AND E. G. VAN HORNE. Univ. of Rochester. *Proc. Soc. Exptl. Biol. Med.* **18**, 140-1(1921).—A per diem dose of 10 g. of raw apples or of bananas will protect a guinea pig against scurvy for 3 mos. An equiv. amt. of these foods cooked at 100° for 15 min., or dried at 55-60°, or both dried and cooked will not protect the animals against scurvy. V. C. MYERS

The destructive effect of oxidation on antiscorbutic vitamine. A. F. HESS AND L. J. UNGER. Col. Phys. Surg. N. Y. *Proc. Soc. Exptl. Biol. Med.* **18**, 143(1921).—Some of the antiscorbutic potency was destroyed by allowing milk to stand in the incubator overnight with H₂O₂, and by subjecting orange juice to O for a short time. This factor is important in comparing the effect of various manipulations on destruction of antiscorbutic power. V. C. MYERS

Studies in the physiology of vitamines. Is water-soluble vitamine identical with secretin? G. R. COWCILL. Yale Univ. *Proc. Soc. Exptl. Biol. Med.* **18**, 148-9(1921).—The effect of exts. of rice polish, wheat embryo, navy bean and yeast, and neutralized tomato juice (all shown to contain vitamine B) on the flow of pancreatic juice and bile in normal dogs and dogs fed a diet lacking vitamine B gave negative results except in the case of tomato juice. V. C. MYERS

The effect of heat and age upon the antiscorbutic vitamine in tomatoes. M. H. GIVENS AND H. B. McCUGAGE. Univ. Rochester and Western Penna. Hosp., Pittsburgh. *Proc. Soc. Exptl. Biol. Med.* **18**, 164(1921).—Guinea pigs are protected against scurvy by daily doses of 2.5 g. fresh raw tomatoes; by 10 g. fresh raw tomatoes heated 1 hr. at 100°; by 2 g. dried tomatoes heated 15 min. at 100°; by 10 g. tomatoes canned at 15 lbs. pressure for 30 min.; by 3 cc. com. canned tomatoes 3 yrs. old; and by 10 g. com. canned tomatoes, 3 yrs. old, cooked 15 min. at 100°. V. C. MYERS

The effects of citrates, malates and phosphates upon the calcium balance and the calcium content of the blood. G. W. CLARK. Univ. Calif. *Proc. Soc. Exptl. Biol. Med.* **18**, 165-6(1921).—Repeated subcutaneous injections of citrate, malate or phosphate have no effect on the Ca balance of rabbits receiving a Ca-rich diet. The Ca content of the blood may be temporarily decreased by the injection of large doses of citrate. Rabbits on a low Ca intake may, after phosphate injection, exhibit a decrease of 20-26% in the Ca content of the blood and still maintain a positive Ca balance. This observation emphasizes the suggestion that animals may adjust themselves to different "Ca levels" just as is true of N. V. C. MYERS

Growth on diets containing more than ninety per cent of protein. T. B. OSBORNE AND L. B. MENDEL. Yale Univ. *Proc. Soc. Exptl. Biol. Med.* **18**, 167-8(1921).—On diets contg. 95% protein (casein), 5% inorg. salts, and vitamines (tablets of alfalfa, and yeast), rats have grown to 3 times their wt. at the beginning of the trial. The vitamine-bearing substances were the only noteworthy sources of either fat or carbohydrate, and supplied 4-8% of the food eaten. V. C. MYERS

The addition of yeast to a milk diet. P. B. HAWK, C. A. SMITH, AND O. BERGRIM. Jefferson Med. Col. *Proc. Soc. Exptl. Biol. Med.* 18, 168(1921).—Rats receiving a diet of milk and yeast made more satisfactory growth gains than did rats receiving milk with no yeast. As milk has been shown to be low in H₂O-sol. "B" vitamine, which is present in yeast in high concn., yeast may be found to be an important addition to the diet of infants.

V. C. MYERS

The nutritive properties of milk, with special reference to growth and reproduction in the white mouse. H. A. MATTILL. Univ. Rochester. *Proc. Soc. Exptl. Biol. Med.* 18, 242-3(1921); cf. *C. A.* 14, 3701.—On a diet of 93% dried whole milk, 2% salt mixt. and 5% yeast, a fourth generation has been obtained in white mice. Animals on this food without yeast become pregnant, and young are born, but they are small, and die within 3 or 4 days.

V. C. MYERS

The presence of vitamine A in the peel of common citrus fruits. E. COOPER. Univ. Chicago. *Proc. Soc. Exptl. Biol. Med.* 18, 243-4(1921).—The addition of evapd. Et₂O and alc. ext. of orange peel to a diet otherwise free from fat-sol. vitamine permitted young rats to mature, mate, and raise young. Similar prepns. from lemon and grape fruit peel also contain the fat-sol. vitamine.

V. C. MYERS

The relation of acid-base equilibrium in the body to excretion of phosphorus and calcium. T. F. ZUCKER. Columbia Univ. *Proc. Soc. Exptl. Biol. Med.* 18, 272-5 (1921).—An attempt was made to formulate the relation of acid-base equil. to the urinary and fecal Ca and P excretion in normal adult man on a mixed diet contg. Ca and P in an easily available form. In the normal period, 57% of P and 28.7% of Ca are found in the urine, while in the alk. period, when 15 g. NaHCO₃ was given, these figures are 44% and 22%, resp. The acid period, in which 300 cc. 0.1 N HCl were given, shows a reversal of this change, more Ca (61%) and P (32.4%) appearing in the urine. The effect of the alk. period was to increase the amt. excreted in the feces, and the acid decreased this amt. The rendering of Ca and P more or less available in this way is of importance in nutrition.

V. C. MYERS

Nutritive exchanges of animals, a function of body weight. LOUIS LAPICQUE. *Compt. rend.* 172, 1526-9(1921); cf. *C. A.* 3, 1317, 1659.—The relations of nutritive exchanges to body surface and to body wt. are discussed and are illustrated by curves. With the rat and other small animals these relations appear to be nearly alike as shown by closely approximating curves.

L. W. RIGGS

Physiologic mechanism of the resistance of rabbits to the lack of vitamines. J. LOPEZ-LOMBA AND PAUL PORTIER. *Compt. rend.* 172, 1682-4(1921); cf. Portier and Randois, *C. A.* 14, 1703.—Expts. were made by feeding young rabbits, weighing less than 1 kg., and adult rabbits weighing more than 1 kg. with various rations sterilized at 125° to 130°, or rations naturally deficient in vitamines. Adult rabbits resisted indefinitely the deficiencies in rations sterilized at high temps. while young rabbits died. It appears probable that the bacteria, which develop normally in the lymphoid tissue, furnish the vitamines lacking in the ration. In the young rabbit this source of vitamines is insufficient and the younger the animal the more rapidly it approaches a fatal termination.

L. W. RIGGS

Report of the Department of Station Chemist. C. T. DOWELL. Oklahoma Agr. Expt. Sta., *20th Ann. Rept.* 1920, pp. 28-29.—Rabbits were fed peanuts for 40 days, after which some were killed, and others were starved for 3, 4, and 7 days. The results indicate that the liquid fat is used first and that the back fat is used before the fat of the kidneys. In working with grain sorghums, it is stated that the results show that no definite relation exists between the amt. of oxidase and the amt. of Mn present in different sorghums.

J. J. SKINNER

ABNORMAL

The present position of diabetes treatment. CARL VON NOORDEN. *Umschau* 25, 517-20(1921). E. J. C.

Studies on experimental rickets. VIII. The production of rickets by diets low in phosphorus and fat-soluble A. E. V. MCCOLLUM, NINA SIMMONDS, P. G. SHIPLEY AND E. A. PARK. Johns Hopkins Univ. *J. Biol. Chem.* 47, 507-27(1921); cf. *C. A.* 15, 882.—Rats receiving a diet apparently deficient only in fat-sol. A and in P but contg. 2% CaCO_3 (and therefore adequate in Ca) developed rickets. The addition of 0.5% butter-fat prolonged life but did not prevent the appearance of rickets; in fact, by prolonging life it seemed to afford time for fuller development of rickets. Increasing the Ca:P ratio led to an even more marked degree of rickets. From these expts., others as yet unreported and those of Sherman and Pappenheim (cf. *C. A.* 15, 3516) it is concluded that rickets may be produced by disturbances in the diet of the optimal ratio between Ca and P in the absence of an amt. of an org. substance contained in cod liver oil sufficient to prevent them. The relation between Ca and P in the diet is of greater importance in securing proper calcification than the abs. amts. of the salts themselves.

I. GREENWALD

Pellagra. J. C. DENSTEN. Scranton, Penn. *Am. J. Clin. Med.* 28, 379-84 (1921).—Review of theories as to the cause of pellagra with report of a case. Pellagra is not considered contagious, but to be due to dietary faults. H. B. LEWIS

The effect on the guinea pig of deprivation of vitamine A and of the antiscorbutic factor, with special reference to the condition of the cosochondral junctions of the ribs. FRANCIS M. TOZER. Lister Inst. *J. Path. Bact.* 24, 306-25(1921).—The results are recorded of expts. on guinea pigs which were devised to investigate and distinguish between the effects produced of antiscorbutic factor, of vitamine A, or of both. The effect of deprivation of vitamine A is indistinguishable from the effect of scurvy.

JOHN T. MYERS

A new diet for gastric ulcer. W. COLEMAN. Univ. and Bellevue Hosp. Med. Col. *Proc. Soc. Expl. Biol. Med.* 18, 43-4(1920).—Complete rest is given the stomach for 3 to 5 days through use of glucose enemata. Then 2 or 3 and later 5 or 6 egg whites, and olive oil gradually increased up to 150 cc. a day are given by mouth, with 100 g. glucose given by rectum, bringing the energy intake to 2200 calories. This is continued for 3 or 4 wks. Satisfactory results have been observed during 8 yrs. experience with this diet. It aids in protecting the ulcer from mechanical and chem. injury. V. C. M.

The carbohydrate-fat ratio in relation to the production of ketone bodies in diabetes mellitus. W. S. LADD AND W. W. PALMER. Johns Hopkins Univ. and Hosp. *Proc. Soc. Expl. Biol. Med.* 18, 109-10(1921).—A study of the percentage relationship of fat and carbohydrate in the diet of diabetic patients, when ketone compd. excretion showed a marked increase, suggests that the ratio of carbohydrate to fat necessary for complete oxidation of the fat may be about the same as Zeller obtained for normal people.

V. C. MYERS

The glucose mobilization rate in hyperthyroidism. B. J. SANGER. Columbia Univ. *Proc. Soc. Expl. Biol. Med.* 18, 117-20(1921).—In all of 8 cases of Grave's disease studied, there was an original increase in the total metabolism of 30% or over; in all but 1 case there was an increase in the carbohydrate metabolism as manifest by the high respiratory quotient and the calculated amt. of carbohydrate burned. The plethora of carbohydrate in the blood stream might account for this increase. The evidence seems to point to the fact that the liver has a decreased ability to demobilize carbohydrate from the blood stream, or perhaps there is a hypermobilization rate.

V. C. MYERS

The failure of rats to develop rickets on a diet deficient in vitamine A. A. F. HESS,

G. F. McCANN AND A. M. PAPPENHEIMER. *Col. Phys. Surg. N. York. Proc. Soc. Exptl. Biol. Med.* **18**, 266-7 (1921).—A lack of fat-sol. vitamine in a dietary otherwise complete does not lead to the development of rachitic lesions in rats. **The effect of various modifications of a diet producing rickets in rats.** A. M. PAPPENHEIMER, G. F. McCANN, T. F. ZUCKER, AND A. F. HESS. *Proc. Soc. Exptl. Biol. Med.* **18**, 267-70 (1921); cf. *C. A.* **15**, 3308.—The protection against rickets in rats conferred by basic K phosphate is due to the phosphate and not the K. The minimal amt. of phosphate (calcd. as P) is between 50 and 25 mg. %. Further data are given to show that in rats, absence of fat-sol. vitamine does not produce rickets, nor does its presence prevent it. "Harris yeast vitamine" gave complete protection against rickets in 3 rats. It is sufficiently rich in P to account for the protection. V. C. MYERS

Metabolism of a dwarf. FRITZ B. TALBOT. *J. Am. Med. Assoc.* **74**, 1225 (1920).—In the case reported of a 7-year-old boy, the cause of dwarfism was unknown, as the child appeared normal in all respects except size. The results of the metabolism studies on this boy show that in order to make him gain in wt. he must receive as many cal. as a normal boy of the same age, and a great many more cal. per kg. than a normal boy of the same age or wt. Undoubtedly he will require at least twice as many cal. as the basal metabolism gives, or approx. 120 cal. per kg. This is similar to what was found to be true in atrophic infants, who required from 160 to 180 cal. per kg. before they gained. L. W. RIGGS

F—PHYSIOLOGY

ANDREW HUNTER

The biology of blood plasma. H. SACHS AND KJ. VON OETTINGER. *Inst. Krebsforschung Heidelberg Münch. med. Wochschr.* **68**, 351-3 (1921).—Heating citrated plasma of pregnant women for 3-5 min. to 55° (1 part 2% Na citrate and 9 parts blood) yields an abundant coarsely flocculant ppt., while the blood plasma of the new born gives as a rule only a turbidity, sometimes fine flocs, rarely coarser flocs. On prolonged heating the differences become much less marked. Marked differences of pptn. also were observed (1) on adding 1 cc. alc. dild. 6 times with saline to 0.2 cc. citrate plasma, (2) on addition of 0.4-0.5 cc. satd. NaCl soln. to 0.5 cc. plasma (with or without dild. with equal vol. of saline soln.), (3) on addition of 0.2 cc. $1/2$ satd. $(\text{NH}_4)_2\text{SO}_4$ soln. to 0.5 cc. plasma. Here as with the heating the pptn. was very much more pronounced with plasma of pregnant women than with that of new born, while here as there the plasma of normal individuals stands in between. The surface tension of the plasma gravidae seems to be less than that of the new born. This difference disappears more or less on cooling to 0°. The detns. were made with the Traube stalagmometer. Attention is called to the great velocity of blood corpuscle sedimentation in pregnancy as against the diminished velocity in blood of the new born. S. ÅMBERG

The spatial division of glycogen and diastase in the liver cell. E. J. LESSER. *Biochem. Z.* **119**, 108-20 (1921).—Expts. are reported of the effects of perfusion of frog livers with Ringer soln. from animals at different months of the year. The results indicate that a decrease in H_2O content of the liver gives rise to an increased hydrolysis of the liver glycogen. It is, therefore, a simple physical phenomenon attributable to a shrinking by loss of H_2O of the cell colloids, with a consequent alteration of the chem. organization of the cell. The spatial division of diastase and glycogen is accordingly changed. It is possible that the diffusion path between the two is shortened by this shrinkage. And it is also possible that on account of the reduction in surface the adsor' ed diastase is set free. These results are considered as important in relation to the hyperglycemia following hemorrhage, since H_2O pours from the tissues into the blood after such an occurrence. F. S. HAMMETT

Comparative studies of the glucose concentration in arterial blood and venous

blood from the muscles. V. HENRIQUES AND R. EGE. *Biochem. Z.* **119**, 121-33 (1921).—The expts. reported in this paper demonstrate that on account of the extreme rapidity of circulation it is not expected that large differences in sugar content of arterial and venous blood can be found. Nevertheless the decrease in the blood sugar during circulation through a muscle is both a relative and an absolute index of the sugar utilization of that muscle. Since muscles are in fact depots for carbohydrates under certain circumstances it is to be expected that during the passage of blood through the muscles no sugar loss is detectable. On the other hand when the blood sugar is high, its rapid disappearance during the flow of blood through the muscle can only be attributed to a noticeable deposition. This rich carbohydrate store, which the muscle then holds, gives rise to such a decided sugar mobilization, when the blood sugar has fallen to a normal value that the venous blood from the muscle may have more sugar than does the arterial blood going to the muscle.

F. S. HAMMETT

Is carbon dioxide tension or protein swelling the cause of muscle contraction? II. LEONH. WACKER. Univ. München. *Biochem. Z.* **120**, 284-302 (1921).—A critical and analytical discussion of the theories of muscle contraction. W. considers that the protein swelling theory as a working hypotheses for muscle studies is not to be recommended because the first basis for such a theory is the presence of free lactic acid, which has been disproved. The objections of Fürth (cf. *C. A.* **15**, 1539) to the osmotic theory are invalid as are his strictures concerning the CO_2 theory. The presence of alkali albuminates in fresh muscle and their absence in dead indicate that in the post-mortem acid formation a protein compd. is split off which causes rigor mortis. The presence of free lactic acid speaks against the swelling theory of rigor mortis. Moreover, the course of CO_2 production in anoxybiotic work is a support for the CO_2 theory of muscle contraction; the residual shortening of muscle on fatigue is explicable on the basis of the CO_2 theory; and tonic muscle contraction can be attributed to a reversible protein ptn. according to the CO_2 theory, which functions without metabolism, heat and fatigue phenomena. The chem. processes in glycogen exhaustion fall into 3 hydrolytic, which raise the osmotic pressure, and later 3 neutralization, in which a CO_2 tension develops, and into 4 oxidation processes, which lead to recovery and regeneration of the alkalescence.

F. S. HAMMETT

Correction for: "the significance of the respiratory quotient, etc." S. WEISS. Univ. Budapest. *Biochem. Z.* **121**, 40 (1921); cf. *C. A.* **14**, 1704.—In table XI on page 25, in column 3 of the article referred to read "the frequency of respiration increased" for "the lung ventilation was increased" also on page 26, first line for "3½ times" read "9¼ times."

F. S. HAMMETT

Contribution to the physiology of the glands. XLV. The reaction of thyroidless and thymectomized rabbits to heat puncture. LEON ASHER AND WERNER NYFFENEGGER. Univ. Bern. *Biochem. Z.* **121**, 41-63 (1921).—A report of the effects of puncture of the medullary heat center in thyroidectomized, thymectomized and thyrothymectomized rabbits. Studies of the temp. changes of the operated animals lead to the conclusions that several punctures made on the same rabbit produce the same result in each case. The removal of the thyroid from an animal shortens the duration of the reaction to puncture as well as causing a definite lowering of temp. The same effect is produced by simple thymectomy and by thyrothymectomy. In those rabbits in which a temp. fall was caused by puncture before removal of the thyroid or thymus, there occurred a more marked depression after extirpation of the glands in question. **XLVI. The action of the thyroid hormone in the disturbed carbohydrate metabolism of phlorhizin diabetes.** LEON ASHER AND WALTER HORRISBERGER. Univ. Bern. *Biochem. Z.* **121**, 64-75 (1921).—Basal metabolism detns. were made of phlorhizized rats which had been fed thyroid. The expts. showed that metabolism is raised whether the carbo-

hydrate depots had been depleted by phlorhizin or not. Phlorhizin produces glucosuria in the albino rat, which is marked, lasting and const. When given alone it does not raise the basal metabolism; in fact this phase sinks a bit, as does respiratory quotient.

F. S. HAMMETT

Secretion of saliva during walking in the mountains. I. Secretive activity and concentration. ALBERTO AGGAZZOTTI. Inst. Physiol., Torino. *Arch. sci. med.* **44**, 60-83(1921).—Secretion of saliva, as detd. by chewing on rubber for 5 min., can decrease as much as 70% from the normal for the individual during and after walking at high altitudes, the decrease being related to the loss of water and salts to which the individual is subjected and being greater among those in poor health. The conc. does not increase in proportion, although the greatest concn. was observed in those in poor health when the diminution of secretion was greatest. The NaCl content tends to decrease slightly. **II. Viscosity and reaction.** *Ibid* **84-9**(1921).—The viscosity decreased, while the reaction, as measured by the p_H , remained normal. M. HEIDELBERGER

The carbon dioxide carriers of the blood. DONALD D. VAN SLYKE. Rockefeller Inst. *Physiol. Reviews* **1**, 141-76(1921).—The carriers of CO_2 may be most simply described as substances which hold in combination alkali, of which they supply to CO_2 as it enters the blood sufficient to bind nearly all of it as alkali bicarbonate. When the CO_2 leaves the blood, they recombine with their alkali. By such reactions, despite changes in CO_2 content and CO_2 tension, the alkalinity of the blood in a given normal individual is maintained const. within marvelously narrow limits. The chief CO_2 carrier of the blood is hemoglobin. It is almost as completely responsible for the transport of CO_2 in the blood as it is for the transport of O. Of the alkali furnished to neutralize the CO_2 that enters the venous blood, from 80 to 95%, sometimes possibly all, comes from the hemoglobin. Of such alkali, the greater part is set free when the relatively strong acid, oxyhemoglobin, is changed by loss of O to the much weaker one, reduced hemoglobin. A smaller part of the alkali is furnished by the unchanged oxyhemoglobin, which is itself an efficient buffer at blood reaction. The relatively slight remainder is furnished by the other buffers, *viz.*, the phosphates in the cells, the proteins in the plasma, and the bicarbonate. The hemoglobin from its location in the cell is able to increase the alkali content of the plasma by withdrawing Cl into the cells from the plasma NaCl, thereby leaving the Na to form $NaHCO_3$. By means chiefly of the exchange of H_2CO_3 and HCl with the plasma, the cells are enabled to use their reserves of buffer alkali to maintain constancy of reaction in the plasma, although the buffers themselves (hemoglobin and phosphates) do not leave the cells. E. R. LONG

The effect of prostatectomy on the behavior and learning of albino rats. D. I. MACHT AND W. BLOOM. Johns Hopkins Univ. *Proc. Soc. Exptl. Biol. Med.* **18**, 100-1 (1921).—The extirpation of the prostate exerted no influence either on the behavior or the rate of learning of albino rats, as studied in the circular maze. V. C. MYERS

General effects of increased and decreased pressures of oxygen on dove embryos. O. RIDDLER. Carnegie Sta. Expt. Evolution. *Proc. Soc. Exptl. Biol. Med.* **18**, 102-5 (1921).—Embryos in the youngest stage are much affected by prolonged high concns. of O. Treatment with reduced O pressures has produced monsters in embryos aged 2 days or less at time of treatment. Longer periods of exposure are more lethal than are 24-hr. periods; adequate compensatory changes are limited to definite stages or ages of the embryo. The adult bird readily survives 24-hr. periods in 10% or 95% O. Older embryos are able to survive the highest % of O, while the youngest stage best survives increased O pressures. V. C. MYERS

The reserve energy of actively growing embryonic tissues. M. T. BURROWS. Washington Univ. Med. Sch. and Barnard Free Skin and Cancer Hospital. *Proc. Soc. Exptl. Biol. Med.* **18**, 133-6(1921).—Heart muscle fragments of young chick

embryos contract actively in an atm. of pure N for 5 or 6 hrs., and less actively often for 20 to 24 hrs. The cells of young embryonic tissue may grow in an atm. of pure N for a short time. This absence of O leads soon to their rapid disintegration. This ability of the cells to grow without O is lost with development; it fails in the case of cells of older embryos.

V. C. MYERS

Studies in the regeneration of blood. E. M. K. GEILING AND H. H. GREEN. Yale Univ. *Proc. Soc. Exptl. Biol. Med.* 18, 191-2(1921).—Single hemorrhages, equiv. to 2% of body wt., and double hemorrhages of 2% on 2 successive days, were carried out on rats; by the latter method the erythrocyte count and hemoglobin content were reduced to $\frac{1}{3}$ normal. On usual mixed food, regeneration of blood was complete in 7-10 days after single, and in 10-14 days after double hemorrhage. Splenectomy appears to have no retarding effect; starvation and the feeding of diets deficient in protein, vitaminine, or mineral matter appear to be retarding factors. V. C. MYERS

Is glycogen the source of acids developed in autolysis? W. MORSE. West Virginia Univ. *Proc. Soc. Exptl. Biol. Med.* 18, 246-7(1921).—From studies on autolysis of beef liver in which detns. of amino N formed and H⁺ concn. produced were made, it appears that glycogen is one of the precursors of substances causing increased acidity in autolyzing tissues. The carbohydrate part of nucleosides, the deaminized residue of NH₂ acids and fats and phospholipins may also contribute to such acid production.

V. C. MYERS

G—PATHOLOGY

H. GIDEON WEILS

Röntgen-ray treatment of the spleen in cases of hemophilia. H. NEUPFER. Univ. Tuebingen. *Münch med. Wochschr.* 68, 40-2(1921).—The beginning and the end of the coagulation time was detd. with the app. of Buerker. Normal blood begins to coagulate in 4-5 min. and the coagulation is finished in 9-10 min. The Röntgen raying of the spleen proved useful in the treatment of hemophiliac hemorrhages by decreasing the coagulation time. This is probably brought about by the destruction of leucocytes in the spleen and the consequent liberation of thrombokinase. S. AMBERG

The present status of the fat antibodies. H. SCHMIDT. Univ. Hamburg. *Münch. med. Wochschr.* 68, 69-71(1921).—No new observations. S. AMBERG

Structure of the red blood corpuscles and hemolysis. H. BECHHOLD. *Münch. med. Wochschr.* 68, 127-30(1921).—On the basis of studies comparing the behavior of optically homogeneous lecithin cholesterol mixts. (soln. of cholesterol in lecithin) with the behavior of hemolyzing erythrocytes on ultramicroscopic observation, the conclusion is reached that the skin of the erythrocyte (the stroma) is formed of a network of protein holding by adsorption a homogeneous mixt. of lecithin-cholesterol. The protein and lecithin are in a state of swelling in physiol. salt soln. Hemolysis occurs as soon as the mixt. of swollen protein, swollen lecithin, cholesterol is disturbed. It must be brought about (a) by adsorption of the lipoid mixt. away from the protein network (shaking with fuller's earth, kaolin, etc.), (b) by changing the state of hydration of protein and lipoid mixt. unequally by physical means, for instance, freezing, heating, (c) by changing the state of hydration of protein and lipoid mixt. unequally by chemical means, for instance, concd. solns. of neutral salts, many dil. solns. of heavy metals such as HgCl₂, (d) by disrupting the mixt. of lecithin and cholesterol (water and hypotonic salt solns.), (e) by dissolving fats (ether, alc., bile salts, etc.), (f) by coagulating one of the lipoids or by removing it from its combination, or by combining with it (saponin, cobra venom, tetanolysin, etc.). In most instances several of these factors act together. S. AMBERG

General increase of body functions following therapeutic Roentgen-ray exposures. P. KAZNELSON AND J. H. LOZANT. Deut. Univ. Prag. *Münch. med. Wochschr.* 68, 132-5(1921).—Raying of spleen may shorten the coagulation time of blood. This

may also occur after raying other regions of the body. At other times, apparently on higher dosage, the coagulation time may increase. The fibrinogen content of the blood increased, nearly always reaching the max. the same or the next day. The blood sugar may be increased. When rayed at a time when the typhoid agglutinin titer of patients recovering from typhoid fever decreased, a short increase of the titer was frequently observed. In some cases the bilirubin content of the blood increased after raying. The blood catalase did not change.

S. AMBERG

The coagulation of blood in cases of splenectomy. E. WÖHLISCH. Univ. Kiel. *Münch. med. Wochschr.* **68**, 228-30 (1921).—The progress of the coagulation of the blood was not injured by splenectomy in 3 cases. Röntgen raying of the region of the spleen did not exercise any favorable effect on the coagulation. In one case, where the raying before the extirpation of the spleen had only decreased the coagulation time, raying of the region of the spleen after extirpation was also followed by a shortening of the coagulation time, while, paradoxically, the coagulation accelerating factor (Stephan) was decreased.

S. AMBERG

The skin pigment and its relation to Addison's disease. K. HENDORFER. Univ. Köln. *Münch. med. Wochschr.* **68**, 266-7 (1921).—Dopa is an abbreviation of dihydroxyphenylalanine. When sections of skin are placed in dopa soln. the epithelium becomes smoky gray, and in the basal cells black granules appear. On the whole, the more pigment the cells contain the more pronounced is the dopa reaction. It is shown that this reaction is not interfered with when the sections are first boiled $\frac{1}{2}$ -1 hr. Pyrocatechic acid and pyrogallol also are oxidized. The coctostability as well as the lack of substratum specificity are adduced as proof that the dopa reaction is not due to an oxidase. The intensity of AgNO_3 reduction and of the dopa reaction coincide well with each other. When uric acid, a reducing substance, is added to dopa soln. and access of air is permitted the oxidation of the dopa is accelerated. The dopa reaction is regarded as another demonstration of the primary reducing action of the pigment of the skin or its precursors. The pigmentation of the skin in Addison's disease is looked upon as the visible sign of an increased activity of the skin in an effort to compensate for the failure of the adrenal glands.

S. AMBERG

Blood examination in cases of myxedema. G. DEUSCH. Univ. Rostock. *Münch. med. Wochschr.* **68**, 297-8 (1921).—The work will be published elsewhere in detail. Seven cases of myxedema were examd. (the viscosity of the blood serum was increased in the majority or high normal). The refractometric examn. of the serum showed always an increase of the protein content.

S. AMBERG

Accumulation of iodine in cancer tissue. F. JESS. Univ. Giessen. *Münch. med. Wochschr.* **68**, 323-4 (1921).—A patient with carcinoma of the bile passages and metastasis in the liver received for 4 weeks before exitus, alival (organic I prep.) intramuscularly and iodipin per os. I was retained. After death the I content of the tissues was examd. The blood contained 21 mg. I as KI per 100 g., thyroid 50.6, intestinal tract 28.2, skin 23.9 g., tumor 21.0, ovary 17.0, liver 14.6, spleen 13.9, uterus 12.3, kidney 11.5, heart muscle 8.6, skeletal muscle 7.2. It is seen that the tumor contained more I than the liver.

S. AMBERG

The chemical nature of the flocculent precipitate which is formed in the Sachs-Georgi-Meinicke reaction and in the toxin-antitoxin test of Georgi. P. NIEDERHOF. Staatl. Inst. exp. Therapie. Frankfurt a. M. *Münch. med. Wochschr.* **68**, 330-1 (1921).—The flocculent ppt. of the Sachs-Georgi reaction and of the Meinicke modification was c.ified and extd. with ether and alc. The greater part is extd. The cholesterolized alc. beef-heart ext. (used for the reaction) when exposed to Os vapors reacts like the flocculent ppt. The ether residues of ppts. obtained according to Sachs-Georgi contain much more cholesterol than those obtained according to Meinicke. The antigen used

by Meinicke contains much less cholesterol. Georgi added to suitable toxin-antitoxin mixts. (diphtheria, tetanus, dysentery) cholesterolized beef-heart ext. and obtained a flocculent ppt. This also is composed chiefly of ether- and alc.-sol. substances. The conclusion is reached that the greater part, if not all, of the flocculent ppts. of the Sachs-Georgi-Meinicke reaction consists of ether- and alc.-sol. substances which are derived from the beef-heart ext.

S. AMBERG

Acute yellow atrophy of the liver. MAX KAHN AND JOSEPH BARSKY. Beth Israel Hosp., New York. *Arch. Intern. Med.* **28**, 142-50 (1921).—Two livers that had undergone acute yellow atrophy were analyzed with the following results: H_2O , 82.8 and 75.4%; org. matter, 14.8 and 21.9%; ash, 2.41 and 2.72%; insol. ash, 0.004 and 0.21%; fat, 2.17 and 8.32%; cholesterol, 0.41 and 0.35%; phosphatides, 7.63% dry substance; sulfatides, 0.204% moist substance (normal 0.802%). The ash consisted of 27.3-24.9% Na, 27.2-23.2% K, 2.19% Ca, 0.82% Mg, 0.43% Fe, 41.5% P, 1.24% S, 5.10-5.38% Cl and 0.09% SiO_2 .

I. GREENWALD

The synthesis and elimination of hippuric acid in nephritis: a new renal function test. F. B. KINGSBURY AND W. W. SWANSON. Univ. Minnesota. *Arch. Intern. Med.* **28**, 220-36 (1921).—Much of the previous work on the synthesis of hippuric acid in nephritis is valueless because the methods employed involved evapn. of an alk. soln., with consequent decompn. of the hippuric acid. In this work all specimens were collected in 2% HNO_3 (15 cc. for a 3-hr. specimen). For the detn. of both free and total $PhCOOH$ it is essential that all protein be removed. For the former purpose, measure 100 cc. urine into a 200-cc. volumetric flask, add 4 drops 0.10% methyl red soln. and sufficient *N* NaOH soln. to make the mixt. yellow. After adding 0.1 *N* HCl until just red, add 0.5 g. tannic acid, shake until dissolved, dil. to the mark and filter through a dry filter. In 100 cc. of filtrate det. $PhCOOH$ according to the method of Raiziss and Dubin (*C. A.* **9**, 920). For detn. of total $PhCOOH$, measure 100 cc. urine into a casserole, add 4 drops 0.1% soln. methyl red, then *N* NaOH until just yellow. Heat to boiling and add, while boiling, sufficient 0.1 *N* HCl to make definitely red. Filter and wash with two 100-cc. portions boiling H_2O . Add 10 cc. 5% NaOH and continue the detn. as described by Folin and Flanders (*C. A.* **6**, 2245), except that the $CHCl_3$ ext. is filtered through a dry paper; this is extd. with 25 cc. fresh- $CHCl_3$. The $CHCl_3$ is also used to rinse the separatory funnel from which the ext. was drawn and is then filtered through a second dry paper. “ $PhCOONa$, in 2.4 g. doses, is completely synthesized into hippuric acid and eliminated as such in individuals whose kidneys have been demonstrated to have been damaged extensively, these findings having in some cases been checked by necropsy findings. In nephritis, hippuric acid is excreted at the same rate, whether its source was ingested $PhCOONa$ or an equiv. amt. of Na hippurate. Neither $PhCOOH$ itself nor any salt of it has been found in the urine of any patient so far studied after the ingestion of $PhCOONa$. The 3-hr. output of hippuric acid on a diet free from fruit and cranberries is relatively too small to affect the results obtained when 2.4 g. $PhCOONa$ are ingested, and, therefore, has been disregarded in making the benzoate tests. From 95 to 100% of the 2.4 g. of ingested $PhCOONa$ appears in the urine as hippuric acid within 3 hrs. and represents the normal average.” In nephritis and in cardiac cases with congestion of the kidneys, much smaller amts. are excreted and, in the cardiac cases, the amts. excreted from day to day vary considerably. $PhCOOH$ cannot be substituted for the Na salt for its relatively low solv. in H_2O probably causes a lower rate of absorption. “We conclude that in man the kidney does not play the leading role in the synthesis of hippuric acid. . . . It may play a minor role, for in the normal individual hippuric acid is excreted at a higher rate after $PhCOONa$ ingestion than after hippuric-acid ingestion in equiv. amt., and this difference is also noted in some of the cardiac cases, but not in the advanced nephritis.” I. GREENWALD

The causes of the variations in the sedimentation of the corpuscles and the formation of the crusta phlogistica ("size," "buffy coat") on the blood. H. C. GRAM. Rigshospital, Copenhagen. *Arch. Intern. Med.* **28**, 312-30 (1921).—Blood, 4.5 cc., was received in 0.5 cc. 3% citrate and the mixt. used for the following detns.: (1) velocity of sedimentation; the appearance of more than 1 mm. of plasma on standing for 10 min. was observed only in cases of anemia or hyperinosis; (2) coagulation time on recalcination (*Johns Hopkins Hosp. Bull.* **31**, 364 (1920)); (3) platelet count (Gram, *Arch. Intern. Med.* **25**, 325 (1920); *Acta med. Scand.* **54**, 1 (1920)); (4) corpuscular vol.; (5) plasma color (Meulengracht, *C. A.* **14**, 572); and (6) fibrin content by an unpublished technic. The formation of the crusta phlogistica was observed by receiving 1 cc. blood in a tube of 9-10 mm. diam. and allowing it to clot while the tube was kept upright. The corpuscular vol. in normal women was found to be from 37 to 45, av. 41%; in normal men, from 43 to 51, av. 48%. Low vols. were found in many pathological conditions and in normal pregnancies. The fibrin content of the plasma, in 25 men and 25 women, varied between 0.20 and 0.38 g. per 100 cc., the averages being 0.27 g. for men and 0.29 for women. It was increased in nearly all infectious diseases, in cancer, nephritis, pregnancy, polyarthritis and after injections of sterile milk. A low content was found in some, but not nearly all, severe degenerations of the liver. The formation of the crusta phlogistica is a pathol. phenomenon which depends upon an accelerated sedimentation or a lengthened clotting time. The former of these may be due to an increased fibrinogen content, to a low corpuscular vol. or to a temp. slightly higher than usual. The coagulation time is lengthened in hemophilia, pernicious anemia, lymphatic leucemia, influenzal pneumonia, etc.

I. GREENWALD

Observations on the relation of urea to uremia. LOUIS LEITER. Univ. Chicago and Otho S. A. Sprague Mem. Inst. *Arch. Intern. Med.* **28**, 331-54 (1921).—Detns. of the urea content of the blood after injections of urea indicated that urea passes rapidly out of the blood into the body tissues and is there present in the same concn. as in the blood. Injected intravenously as a 33% soln. at the rate of 2 g. urea per min., from 0.75 to 1.3. av. 1.1%, of the body wt. was required to kill dogs. The symptoms observed included salivation with excretion of urea in the saliva, vomiting, increased reflex irritability, tremors, twitchings, tonic then clonic convulsions, dyspnea, coma. At necropsy, there were marked hemorrhages in the submucosa and mucosa of the stomach and small intestine, subpleural hemorrhages with congestion and edema of the lungs, fatty degeneration of Henle's loops and cloudy swelling of the convoluted tubules of the kidney. In dogs having one ureter ligated, similar symptoms were observed after the injection of from 0.6 to 1.1, av. 0.8%, urea. Four dogs had both ureters ligated. They lived from 1.5 to 4 days and displayed anorexia, gradually falling temp., increasing drowsiness, etc. They were not under observation at time of death but convulsions were improbable. Bile and gastric contents contained usually more urea than the blood, indicating active excretion.

I. GREENWALD

The diffusible calcium of the blood serum. II. Human rickets and experimental dog tetany. L. VON MEYSENBUG AND G. F. McCANN. Columbia Univ. *J. Biol. Chem.* **47**, 541-6 (1921).—By the method described in *C. A.* **15**, 3648 the % of diffusible Ca was found to lie between 58 and 70% (normal) in 2 specimens of serum from cases of rickets, in which the total Ca was 9.0 and 7.6 mg. per 100 cc. Similar values were obtained in the serum of 4 dogs in tetany after parathyroidectomy, with total serum Ca contents of 6.1 to 8.4 mg. per 100 cc. Two of these dogs had a reduced CO_2 -combining power of the plasma.

I. GREENWALD

The antigen activity of fat. H. BEUMER. Univ. Kinderlinik Königsberg. *Biochem. Z.* **121**, 127-30 (1921).—No agglutinin formation in the sense of Stuber's studies (*C. A.* **11**, 661) is obtained when fat particles of tubercle bacilli, yeast ext. and tebelon

are injected into guinea pigs or Pirquet-positive children. Neither marked increase in wt. nor increase in non-specific serum lipase followed the injection of these fats.

F. S. HAMMETT

Chemistry of the Wassermann reaction. J. FORSSMAN. Univ. Lund, Sweden. *Biochem. Z.* 121, 180-214 (1921).—This extensive report of attempts to isolate the substance responsible for the Wassermann reaction by dialysis, diln., pptn., alc., Et_2O and acetone extn. expts. is too detailed for concise abstracting. The conclusions resulting from the work are that the substance is entirely pptd. with the globulins but that it is not a globulin. A positive reaction can be obtained with dried serum just as well as with alc.-pptd. material. Absolute alc. has no effect on dried serum but may or may not affect the dialyzed serum. Et_2O changes negatively reacting serum so that it gives a positive test, but on inactivation it again becomes negative. The same occurs in cases of self inhibition, which takes place under certain circumstances after Et_2O treatment. Treatment of serum with Et_2O from positive cerebrospinal fluid or from positive dialyzed material prevents, more or less completely, the development of the reaction in serum which was previously positive. If this Et_2O is evapd. the positive reaction returns. Negatively reacting cerebrospinal fluid or dialyzed serum is not affected by Et_2O .

F. S. HAMMETT

A note upon the iodine-phosphoric acid reaction in the urine in syphilis. R. A. KILDUFFE. *Med. Record* 100, 329-30 (1921).—The urine reaction of Gray (*Med. Record* 89, 921 (1916)) designed for use as a diagnostic measure for syphilis is shown by tests to be unreliable and valueless.

F. S. HAMMETT

Thyroid action and fever. E. H. P. WARD. *Med. Record* 100, 399-407 (1921).—A thesis supporting the idea that the thyroid secretion is instrumental in producing the febrile reaction.

F. S. HAMMETT

Protein sensitization with special reference to bronchial asthma, hay fever and eczema. MAXIMILLIAN RAMIREZ. *N. Y. Med. J.* 114, 320-25 (1921).—A presentation of 10 cases in which protein-sensitization studies proved of value in diagnosing the cause of the disorder.

F. S. HAMMETT

Pollen protein intoxication in non-seasonal bronchial asthma. ALEXANDER STIRLING. *N. Y. Med. J.* 114, 328-32 (1921).—In a series of 30 cases, 20 patients, or 66%, had positive skin reactions to one or more pollens which apparently had been the exciting factors in the production of the paroxysmal dyspnea.

F. S. HAMMETT

Clinical gastric analysis with detail of method and a consideration of the maximum information to be obtained. B. B. VINCENT LYON, HENRY J. BARTLE AND RICHARD T. ELLISON. *N. Y. Med. J.* 114, 272-80 (1921).—Of medical value. F. S. HAMMETT

Basal metabolism as an index of treatment in diseases of the thyroid. FRANK H. LAHEY AND SARAH MURRAY JORDAN. Boston. *Boston Med. Surg. J.* 184, 348-58 (1921).—When extraneous factors which influence metabolic rate can be eliminated, a test of the rate of basal metabolism is an invaluable factor in the data necessary for diagnosis of disease of the thyroid; secondly it aids greatly in prognosis; thirdly, it has its greatest value as an index of the results of treatment.

JULIAN H. LEWIS

A review of three-hundred cases of blood chemistry. EDWARD B. BIGELOW. Worcester, Mass. *Boston Med. Surg. J.* 184, 459-63 (1921).—From a review of the blood chemistry in this series of 300 patients, it is to be concluded, that in general, these exams., whether they prove to be normal or abnormal, are functional tests of value in the fuller consideration of cases. Prognosis is extremely poor when there is a high retention of creatinine, and rather poor when a high urea retention obtains. The detn. of the alk. reserve is valuable in diabetes mellitus and to a lesser degree in nephritis. Repeated sugar detns. are invaluable as guides in the treatment of diabetes mellitus.

JULIAN H. LEWIS

Studies on the relation between agglutination and conagglutination. I. The production of conagglutination for paratyphoid-B bacilli during immunization with typhoid bacilli. K. AOKI AND T. KONNO. Sendai, Japan. *Centr. Bakt. Parasitenk., Abt. I* 86, 139-60(1921).—Rabbits injected subcutaneously, intravenously or intraperitoneally with increased doses of typhoid bacilli produce agglutinins and conagglutinins until a maximal titer is reached. At this period the conagglutinins show as high titer as the main agglutinins. The rapidity of development of the 2 reactions during immunization is not the same. During the first part of immunization the chief agglutinins show a greater and during the last part a smaller rate of production, while for the conagglutinins the reverse is true. The relation between agglutinin and conagglutinin can be expressed by a fraction wherein the agglutinin is the denominator and the conagglutinin is the numerator. At the beginning of immunization the fraction is rather large, as $1/2$ or $1/4$, but it then decreases until a minimal size is obtained and then increases until it may become $1/1$. The point where the fraction is minimal is where the greater rapidity of production of the chief agglutinin ceases and becomes less than the conagglutinin. After subcutaneous injections it appears later than after intravenous injections. The abs. value of the minimal fraction is not always the same but depends chiefly on the dose of bacteria, the time and place of injection. It is less after subcutaneous injections than after intravenous.

JULIAN H. LEWIS

Studies in hypersensitivity. CARL PRAUSNITZ AND HEINZ KÜSTNER. Univ. of Breslau. *Centr. Bakt. Parasitenk., Abt. I* 86, 160-9(1921).—Hypersensitivity to fish was established in a patient by intracutaneous and enteral introduction of the antigen. The active substance is in fish muscle but not in the blood serum, not in most of the organs or the roe of the bony fishes, and only in small amt. in the muscle of cartilaginous fishes. It is not demonstrable in the fresh muscle; it arises only by heating to the coagulation temp. of the protein. The active substance is insol. in alc. and ether in the cold and hot; it is not dialyzable; it is made quickly inactive by acid but is not weakened by alkali, pepsin, and trypsin. The reaction is strongly sp. Precipitins, complement-binding substances and neutralizing substances were not found in the serum of the sensitive person. Guinea pigs could not be passively sensitized with the serum of the patient, but sensitization could be transferred to a normal person by injecting the serum intracutaneously and 24 hrs. later injecting the antigen intracutaneously in the same place. This sort of sensitization has not been accomplished with the serum of patients sensitive to pollen protein, to tuberculin or to horse serum. Perhaps it is possible with the serum of patients more highly sensitized than those who have been studied. After frequent intracutaneous injection of the fish antigen there was a lowering of the sensitivity.

JULIAN H. LEWIS

A new simple diagnostic serum reaction for syphilis. H. KODAMA. Kanazawa, Japan. *Centr. Bakt. Parasitenk., Abt. I* 86, 211-13(1921).—The reaction described is in principle the same as used by Meinicke and Sachs and Georgi. K. claims to have devized his method before knowing about the others. Full directions for making the reagents and performing the test are given.

JULIAN H. LEWIS

The thermostability of bound antibody. WILHELM SPÄT. Kladno. *Centr. Bakt. Parasitenk., Abt. I* 86, 241-5(1921).—Expts. with complement-binding antibodies and agglutinins have shown that the bound antibodies, contrary to Friedberger and his pupils, have no thermostability in that when sensitized antigen is boiled $1/4$ hr. it recovers its power to take up antigen.

JULIAN H. LEWIS

Changes in the alkali reserve, sugar concentration of the blood, and leucocytes of the blood in experimental infections. EDWIN F. HIRSCH. St. Luke's Hospital, Chicago. *J. Infectious Diseases* 29, 40-6(1921).—Depression of the alk. reserve of the blood in rabbits by intravenous injections of pathogenic bacteria is accompanied by a

transient hyperglycemia, the degree of which depends on the extent of alk. reserve diminution. Subcutaneous administration of carbonate solns. does not prevent the acidosis produced by these injections of bacteria. Injections of KH_2PO_4 solns. depress the alk. reserve of the blood, this lowered alkalinity being associated with a hyperglycemia and by changes in the number of leucocytes similar to those number following injections of bacteria. The concn. of sugar in the blood seems to be independent of the changes in the number of leucocytes. Cf. *C. A.* 15, 393.

JULIAN H. LEWIS

The effect of the injection of adrenaline on the capacity to form antibodies. WALTER FRIEBER. Frankfurt a. M. *Centr. Bakt. Parasitenk., Abt. I* 86, 246-7 (1921).—In rabbits neither the subcutaneous nor intravenous injection of adrenaline nor unilateral adrenalectomy has any effect on the formation of antibodies (agglutinins and hemolysins).

JULIAN H. LEWIS

The effects of filtration on the potencies of antitoxins. W. N. BREG. Washington, D. C. *J. Infectious Diseases* 29, 86-7 (1921).—In every one of 13 filtration expts. with diatomaceous earth, protein was adsorbed from tetanus and diphtheria antitoxic products in quantities ranging from 5 to 33% of the original protein content. In 4 adsorption expts. with fuller's earth, the protein adsorbed was 40 to 78%, depending on conditions. When the exptl. conditions were such that protein adsorption was slight, i. e., 10 to 15%, an adsorption of antitoxic units was not detected. When protein adsorption was high i. e., 20 to 78% of the total protein, a corresponding adsorption of 8 to 66% of the original tetanus antitoxic units was detected. The results indicate that a rapid lab. method of testing whether a filter system adsorbs antitoxic units is to est., by any convenient chem. method, coagulable proteins or solids-not-ash in the original and the filtered product. If there is protein adsorption in large amt. (20% or more), there will be a detectable adsorption of antitoxic units. If protein adsorption is less than 20%, there may be no detectable adsorption of antitoxic units. A rapid, accurate method of standardization of antitoxins *in vitro* is much needed, even if only preliminary values are obtained. It is doubtful whether 2 workers in sep. labs. would obtain values within 10% of each other in the standardization of the same product by the official method. As ordinarily carried out, filtration of an immune serum or similar product through a Berkefeld filter does not result in appreciable losses of antitoxic units.

JULIAN H. LEWIS

The antibodies for sheep blood and complement of the aqueous humor in normal and immunized rabbits. RYAZO KODAMA. John McCormick Inst., Chicago. *J. Infectious Diseases* 29, 161-70 (1921).—The serum of normal rabbits contains lysis and opsonin, also agglutinin in small quantities for sheep corpuscles, but no precipitin for sheep serum. The aq. humor of normal rabbits contains a small amt. of opsonin and lysis for sheep corpuscles, but no agglutinin or complement and no precipitin for sheep serum. On immunization with sheep blood the antibodies mentioned accumulate in the blood, but the aq. humor gives an increase in lysis and opsonin only, remaining free from, other antibodies. On removal of aq. humor by puncture, the new fluid that forms has a far greater amt. of antibodies in it than the original fluid. The normal conditions are regained in about 24 hrs.

JULIAN H. LEWIS

Anaphylaxis reactions with purified proteins from milk. H. GIDEON WELLS AND THOMAS B. OSBORNE. *J. Infectious Diseases* 29, 200-16 (1921).—Cow milk contains 4 chem. distinct proteins or protein fractions, namely, casein, lactalbumin, lactoglobulin and an alc.-sol. protein. By means of the anaphylaxis test it can be shown that these 4 proteins are immunologically distinct. This fact furnishes another striking illustration of the dependence of immunologic specificity on chem. compn. rather than biologic origin. Of these 4 proteins only one, the globulin, sensitizes to beef serum or causes reactions in animals sensitized to beef serum. This corresponds to the observation of Crowther and Raistrick that lactoglobulin and serum globulin are chemically indis-

tinguishable. That some positive cross sensitization may be occasionally obtained between cow milk and beef serum is explained by the fact that the globulin constitutes a very small part of the milk proteins. Several other protein fractions obtained in studying milk proteins were, according to anaphylaxis tests, not distinct from the 4 known proteins of milk. These experiences with milk proteins, as well as with other proteins from other sources, has demonstrated that immunologic methods are a great aid and in many cases indispensable in prep. proteins in the state of purity, and may be used to furnish information concerning chem. relations of proteins from different sources. Attention is called to the probable purpose of colostrum as a means of furnishing large quantities of serum globulin rich in protective antibodies to the newborn young at a time when they can be absorbed from the alimentary canal without destruction through digestion.

JULIAN H. LEWIS

Studies on heterophile antigen and antibody. T. TANIGUCHI. Tokyo. *J. Path. Bact.* 24, 241-56(1921); cf. *C. A.* 15, 2123.—Certain tissues, from a variety of animals, when injected into the rabbit, have the property of generating a hemolytic immune body for sheep corpuscles. This immune body is called heterophile antibody, and the antigen, heterophile antigen. Organs (except blood corpuscles) of guinea pig, dog, cat, horse, mouse, fowl, tortoise, and several kinds of fish are heterophile antigens, also sheep and goat corpuscles. Organs of ox, rabbit, pig, man, rat, goose, pigeon, frog, and eel lack this property. Heterophile antigen is not equally distributed in different organs of the same species. In the guinea pig, the kidney is richer than the liver, while the brain and serum contain small amts. The receptors of heterophile antigens reside in the tissue lipoids, especially those sol. in alc. and ether, but not in acetone. Heterophile hemolytic antibodies combine with lipoids derived from heterophile antigens, fix complement in the presence of such lipoids, and form a ppt. with emulsions of the lipoids. These reactions are quant. parallel. The specific heterogenic reactions are intensified by the addition of cholesterol to the lipid emulsions and by increasing the turbidity of the emulsion. The alc.-sol. lipoids do not generate antibodies nor does the protein residue after extn. of the lipoids. Hence it seems that the antigenic property depends on some protein-lipoid complex, whose combining power resides in the lipoids. JOHN T. MYERS

Observations on the Wassermann test using a method of prolonged fixation at ice-chest temperature. E. J. WYLER. *J. Path. Bact.* 24, 349-54(1921).—Prolonged fixation, av. time 19 hrs., increases the sensitiveness of the Wassermann reaction. A few sera act more strongly when the fixation occurs at 37°. With the ordinary cholesterolized antigen a few mild non-specific reactions occur, but they are never sufficient to make a false diagnosis in an untreated case.

JOHN T. MYERS

Differences in the character of hemolytic immune sera of different origins for sheep corpuscles and on the mechanism of heterophile and isophile cytosis: The separation of combining and antigenic properties. TENJI TANIGUCHI. *J. Path. Bact.* 24, 356-7(1921).—Sheep corpuscles fix larger amts. of heterophile than of isophile antibody, and the combination is firmer. When the same number of doses is used for sensitizing the corpuscles, the heterophile immune body can fix more complement.

JOHN T. MYERS

Heterophile anaphylaxis. TENJI TANIGUCHI. *J. Path. Bact.* 24, 357-8(1921).—The anaphylactic symptoms caused by parenteral injection of heterophile antisera into animals which contain heterophile antigen in their tissues should be attributed to the interaction of heterophile antigen and antibody.

JOHN T. MYERS

Crystalline hemoglobin as a stimulant of foreign body giant cell reaction in the guinea pig. M. J. STEWART. Univ. of Leeds. *J. Path. Bact.* 24, 367-8(1921).—A hematoma in a guinea pig contained many giant cells, within which were crystals of what was apparently hemosiderin, since they gave the Prussian-blue test for Fe.

J. T. M.

Precipitin response in the blood of rabbits following subarachnoid injections of horse serum. H. L. ALEXANDER. Bellevue Hosp. and Cornell Univ. Med. Col., N. Y. *Proc. Soc. Exptl. Biol. Med.* 18, 9-11 (1920).—Rabbits receiving a single dose (0.5 cc.) of normal horse serum into the arachnoid space produce precipitins in the blood in greater abundance, of higher titer, and persisting longer than those in control rabbits receiving a similar injection intravenously. Repeated subarachnoid injections induce precipitins in the blood early. No anaphylactic manifestations occurred in rabbits treated repeatedly with subarachnoid injections when the precipitin content of the blood was high. Anaphylactins were demonstrated in sera with high precipitin content. These expts. may explain clinical manifestations of intolerance to horse serum.

V. C. MYERS

Resistance of hepatic tissues to local anemia. L. R. CHANDLER. Stanford Univ. *Proc. Soc. Exptl. Biol. Med.* 18, 23-4 (1920).—If a temporary renal anemia of 2-hrs. duration is produced in a rabbit, histological study 1 to 4 days later, shows necrosis of the cortical tubular epithelium, with few if any changes in the glomerular and interstitial elements. This is used in studies of epithelial regeneration and the pathology of renal excretion. Almost total anemia produced by temporary ligation of the hepatic artery and portal vein in Eck fistula dogs, for periods as long as 12 hrs., does not cause necrosis of the hepatic parenchyma.

V. C. MYERS

Observations on anaphylaxis in lower monkeys. H. ZINSSER. Col. Phys. Surg. N. Y. *Proc. Soc. Exptl. Biol. Med.* 18, 57-66 (1920).—Anaphylaxis is very difficult to obtain in the lower monkeys, and probably cannot be obtained by a single preparatory injection, but occasionally definite mild anaphylactic reactions can be obtained in these animals. In one case these simulated some of the symptoms associated in human beings with serum sickness; they occurred only in monkeys in which small amt. of antibody could be demonstrated. Monkeys are very poor animals to use for antibody formation; antigen disappears with relative speed and no antibodies appear in some of these monkeys.

V. C. MYERS

A study of the serum of complement-deficient guinea pigs. A. F. COCA. N. Y. Hospital. *Proc. Soc. Exptl. Biol. Med.* 18, 71 (1920).—The deficiency of complement is inherited in a certain race of guinea pigs. The so-called "third piece" of complement is lacking; it is the thermostable element destroyed by cobra venom and absorbed by yeast cells and bacteria. The serum produces no hemolysis when used in a quantity 40 times that of the minimal completely hemolytic quantity of normal serum. The lacking part is not thrombokinase (cytolyse); it is not absorbed out of normal serum by 6 vols. of Et_2O .

V. C. MYERS

The elimination of phenolsulfonephthalein in acute mercuric chloride intoxication. W. DE B. MACNIDER. Univ. N. Carolina. *Proc. Soc. Exptl. Biol. Med.* 18, 73-7 (1920).—When normal dogs are given HgCl_2 in the dose of 4 mg. per kg. diuresis develops. There is also an increase in the elimination of phenolsulfonephthalein during such intoxication. Prior to, or associated with, the appearance of albumin alone, or albumin and casts in the urine, there occurs a reduction in the alk. reserve of the blood. The kidney shows no evidence of injury at this stage. At this early stage there occurs a reduction in blood urea, which may be associated with degenerative changes in the liver first appearing in the liver lobule.

V. C. MYERS

A substance toxic to guinea pigs in the blood of infants with "intestinal intoxication." O. M. SCHLOSS. Cornell Univ. Med. Col. *Proc. Soc. Exptl. Biol. Med.* 18, 101-2 (1921).—The blood of infants with a type of intestinal intoxication may show the presence of a substance toxic to guinea pigs. No evidence is available at present to indicate the nature of this substance or its relation to the disease.

V. C. MYERS

Method of producing chronic focal lesions in animals. H. ZINSSER AND E. H.

RAYMOND, JR. Col. Phys. Surg., N. Y. *Proc. Soc. Exptl. Biol. Med.* **18**, 121-2(1921).—Celloidin capsules contg. agar inoculated with streptococci are dropped into the peritoneal cavity of rabbits. In most cases the rabbits live for months; some gradually emaciate, others develop agglutinins. In 1 case over 4 mos. later the capsule was exa. and found to contain living streptococci, culturally and morphologically identical with the ones that had been put in. This furnishes some evidence against mutations of streptococci in the animal body.

V. C. MYERS

The tuberculin reaction and anaphylaxis as studied by the Dale method. H. ZINSSER. Col. Phys. Surg., N. Y. *Proc. Soc. Exptl. Biol. Med.* **18**, 123-6(1921).—The criterion detg. whether a substance is antigenic or, in other words, an antibody former, appears to be its ability or inability to diffuse.

V. C. M.

Anaphylaxis following the administration of diphtheria antitoxin. J. BRONFEN-BRENNER AND M. J. SCHLESINGER. Harvard Med. School. *Proc. Soc. Exptl. Biol. Med.* **18**, 147-8(1921).—Sensitized guinea pigs receiving subcutaneously a large excess of diphtheria toxin withstand the intravenous injection of at least 5 lethal doses of the antigen to which they were previously sensitized. It seems thus that the clinical observation concerning apparent diminution of anaphylactic reactivity during diphtheria intoxication is borne out by this preliminary expt.

V. C. MYERS

Refractometric studies with the sera of syphilitic patients under arsphenamine and neo-arsphenamine treatment. K. TOKUDA. Dermatological Research Lab. and Wister Inst., Philadelphia. *Proc. Soc. Exptl. Biol. Med.* **18**, 151-3(1921).—There is a marked increase in the refractive index of the serum and in the globulins in syphilis, especially in active secondary cases. Considered in relation to the Wassermann reaction of the sera, before treatment, the strongly positive cases show values of total proteins higher, and of non-proteins lower than the weakly positive cases. When the Wassermann reaction remained persistently positive during antisyphilitic treatment, the refractive index, % of total proteins and the relative amt. of globulins of the sera showed little tendency to drop below their original values. When the reaction became very readily negative the curves fell progressively and rapidly during the course of injections.

V. C. MYERS

The quantitative relation between complement and complement-fixing antibody. R. L. KAHN. Michigan Dept. Health, Lansing. *Proc. Soc. Exptl. Biol. Med.* **18**, 170-1 (1921).—The employment of 2 units of complement is too great an excess of this ingredient for correct results in some cases, and the use of less complement may serve as a finer measure of complement-fixing power of a given serum. The thermostability of complement-fixing antibodies resulting from protein immunization. *Ibid* 171-2.—Sp. complement fixing antibodies withstand a temp. of 75°, while the antibodies present in syphilitic sera are destroyed at 60 to 65°. This suggests that there exist inherent biological differences between the 2 types.

V. C. MYERS

Observations on the specific exhaustion of cutaneous reactions. G. M. MACKENZIE AND L. B. BALDWIN. Presbyterian Hosp., N. Y. *Proc. Soc. Exptl. Biol. Med.* **18**, 214-7(1921).—The reactivity of the skin may readily be abolished in the area involved in the reaction, when the protein soln. is injected into the skin 5 or 6 times at the same site, at intervals of 1 or 2 hrs. This exhaustion has been accomplished with egg white, exts. of ragweed and chicken feathers, the proteins of almond, pea, oat and wheat. The extent of the area exhausted is limited to the site of the reaction. There appears to be a strict specificity for substances biologically unrelated, and group reaction for substances closely related biologically. A non-antigenic substance such as histamine produces a reaction which is not exhaustible, while the above-named substances are antigenic.

V. C. MYERS

Specific immunological reactions of Bence-Jones proteins. S. BAYNE-JONES

AND D. W. WILSON. Johns Hopkins Med. School. *Proc. Soc. Exptl. Biol. Med.* **18**, 220-2(1921).—Precipitin, complement fixation, and anaphylactic reactions showed differences between various Bence-Jones proteins, a mixt. of human serum proteins and Bence-Jones proteins in the preps. made to salt-out the proteins, and complete difference between cryst. Bence-Jones and serum proteins. V. C. MYERS

The supposed relation between alkalosis and tetany and similar conditions. I. GREENWALD. Roosevelt Hospital, N. Y. *Proc. Soc. Exptl. Biol. Med.* **18**, 228-34 (1921).—Convulsions were produced in dogs by intravenous injection of NaHCO_3 ; there was, also, a decrease in H^+ concn. of the blood and plasma. After rapid injection there was apnea, with death from respiratory failure, and not convulsions. A mixt. of bicarbonates of Na, K, Ca, and Mg produced convulsions. The concn. of Na in the plasma required to produce convulsions is approx. the same for NaHCO_3 , NaCl, Na phosphate or Na_2SO_4 . Though Collip accepts the view that tetany is due to alkalosis, he emphasizes the disturbance in the cation equil., while also ascribing a similar stimulating effect to the bicarbonate ion. This sp. effect may be due entirely to the effect of the anion in detg. the permeability of the tissues to the cation. V. C. MYERS

The antigenic properties of ragweed pollen. J. T. PARKER. Columbia Univ. *Proc. Soc. Exptl. Biol. Med.* **18**, 237-40(1921).—Ragweed pollen was shown to be antigenic by expts. on the isolated uteri of sensitized guinea pigs. V. C. MYERS

The concentration of sodium and potassium as compared with that of calcium and magnesium in the serum of patients with active infantile tetany. F. F. TISDALE, B. KRAMER AND J. HOWLAND. Johns Hopkins Univ. *Proc. Soc. Exptl. Biol. Med.* **18**, 252-3(1921).—The Na and Mg content of the serum of children suffering from active infantile tetany falls within the limits of normal. The K content is somewhat elevated and that of Ca markedly diminished below normal. The $(\text{Na}+\text{K})/(\text{Ca}+\text{Mg})$ ratio in the normal infant is 27.8, while in cases of infantile tetany it is 44.5. If the Ca were to remain the same, the ratio would be 27.8. The change in ratio is due almost wholly to decrease in Ca concn. V. C. MYERS

Serumtherapy of advanced botulism. J. BRONFENBRENNER AND H. WEISS. Harvard Med. School. *Proc. Soc. Exptl. Biol. Med.* **18**, 253-4(1921).—In studying the path of absorption of botulinus toxin in guinea pigs, it was noted that in animals kept under Et_2O anesthesia, death following the introduction of toxin was greatly delayed. To study toxin-antitoxin combination, 2 series of guinea pigs were given 50,000 minimal lethal doses of botulinus toxin peros. Usually first symptoms appear in 6 hrs. and death occurs in 12 hrs. Antitoxin was given intravenously after 6 hrs.; the pigs which were not etherized died in 18 hrs. while those which were put under Et_2O anesthesia for 2 hrs. survived. V. C. MYERS

The composite nature of botulinus toxin. J. BRONFENBRENNER AND M. J. SCHLESINGER. *Proc. Soc. Exptl. Biol. Med.* **18**, 254(1921).—Since the potency of purified botulinus toxin as tested by injection remains the same, while the toxicity by mouth is decreased by purification, it seems that the power of crude toxin when absorbed through the intestine is dependent on the presence of secondary substances mixed with the true botulinus toxin. V. C. MYERS

Report on anaphylactic deaths in guinea pigs from intracutaneous injection of small amounts of egg albumin. H. ZINSSER AND S. T. WU. Columbia Univ. *Proc. Soc. Exptl. Biol. Med.* **18**, 261-3(1921).—Several cases of acute death of sensitized guinea pigs by absorption from the skin of very minute amts. of reasonably pure protein are described. Attempts to repeat the result with a dozen guinea pigs have not succeeded. V. C. MYERS

Diffusible calcium in normal, rachitic, and experimental tetany blood. L. VON MEYSENBUG. Columbia Univ. *Proc. Soc. Exptl. Biol. Med.* **18**, 270-2(1921).—There

appears to be no change in the proportion of diffusible serum Ca in human rickets, or in exptl. dog tetany.

V. C. MYERS

Gout and cholesterol. A. CHAUFFARD AND J. TROISIER. *Ann. de Med.* 9, 149 (1921); *J. Am. Med. Assoc.* 76, 1800 (1921).—The authors state that with Grigaut's modification of Folin's technic they found the uric acid content of the blood in gout was regularly 0.1 per 1000, instead of the normal 0.04, and the cholesterol content was likewise abnormally high. In 9 of 13 cases of gout the cholesterol ranged from 1.5 to 2.95 per 1000. The excess of cholesterol is deposited at various points, the process being the same as with urates, only in lesser degree.

L. W. RIGGS

Protein sugar in cancerous patients. H. BIERRY, F. RATHERY AND MISS LEVINA. *Compt. rend.* 173, 55-7 (1921).—In normal persons the protein sugar ranges from 0.6 to 0.8 g. per 1. of venous plasma. In 10 cancer patients the protein sugar ranged from 1.14 to 2.66, av. 1.73 g. per 1. of venous plasma. The higher figures were observed in cases showing multiple metastases with marked cachexia.

L. W. RIGGS

Autocolloidoclasia from cold. F. VIDAL, P. ABRAMI AND ET. BRISSAUD. *Compt. rend.* 173, 207-12 (1921).—Expts. were made with 17 adult dogs after fasting 24 hrs. Immediately before the beginning of the expt. detns. were made of the vasculo-sanguinary equil. formula, coagulation time of blood taken from the jugular vein, leucocytosis, leucocytic formula, and generally the refractive index of the serum. The animals were then plunged into a tub filled with water at 2 to 3°, the head, neck and front paws being the only parts above water, and kept in the cold bath 15 to 45 min. In the course of the chilling and afterwards the above mentioned detns. were repeated at intervals of 10 min. upon blood from the jugular vein. The results were sharply definite. In all cases the chilling caused a hemoclastic crisis identical with that observed in a state of shock. The crisis generally appeared in 10 to 15 min. and continued 30 to 60 min. In a typical case the blood of the dog before immersion gave leucocytes 12,000, polynuclears 78, mononuclears 22, coagulation time 9 min., n 63. After immersion for 20 min. the figures were 8,000, 60, 40, 3, and 57.4, resp.; at 42 min. the figures were 5,000, 32, 68, 2, and 56.7, and at 90 min. the figures were 14,000, 81, 19, 11, and 64.3, resp. Thus cooling produces a shock in all points comparable with the anaphylactic or with the protein shock. Since this phenomenon is the result of a displaced equil. of the interior colloidal medium it is named autocolloidoclasia, of which the shock *a frigore* is a typical example.

L. W. RIGGS

Modifications of the blood plasma and of the urine during starvation in the diabetic. DESGREZ, BIERRY AND RATHERY. *Compt. rend.* 173, 259-61 (1921).—Analyses of plasma and urine of 4 diabetics were made before the fast while on ordinary rations, after 1 day of fasting, and after 2 or 3 days of fasting. In each case the patient before fasting was eliminating acetone substances. The results are assembled in a large table and the following conclusions stated: The proteins increase in the venous plasma principally by an increase in the serum albumin, which is contrary to the observations in the starving normal persons. Both free and protein sugar diminish in the less grave cases, but increase when coma becomes imminent. The urinary sugar diminishes notably and may even disappear. The acetoacetic and β -hydroxybutyric acids and acetone usually declined in amt., the variations of ketonic and those of ketogenic acids were not always parallel, showing that an estn. of only acetone and acetoacetic acid is insufficient. Starvation appears to favor the assimilation of ketonic and ketogenic substances, and a measure of this utilization is indicated by modifications of the blood plasma.

L. W. RIGGS

Catalase content of the blood in different types of anemia. E. B. KRUMBAAR AND JOHN H. MUSSER. *J. Am. Med. Assoc.* 75, 104-5 (1920).—The method of estg. the amt. of catalase was that of Stehle (cf. *C. A.* 13, 3224; 14, 2368). The relation of

catalase content of blood to red blood-cell count per cu. mm. was detd. in 25 pathologic and 4 normal individuals. Anemic blood liberated much less O than normal. Both the actual amt. of O liberated and the resulting indexes varied less in the nonanemic than in the anemic individuals. The catalase content of the blood varies according to the concn. of the red blood cells and this ratio is not materially affected by splenectomy or by the various types of anemia studied.

L. W. RIGGS

Specific precipitin reaction of the lens. LUDVIG HEKTOEN. *J. Am. Med. Assoc.* **77**, 32-3(1921).—The observations on the immune reactions of the lens have been made by means of sp. pptn. tests of lens solns., study of the anaphylactic effects of reinjection of lens solns. in guinea pigs previously injected or sensitized with such solns., and complement fixation tests. All of these are associated with adequate control procedures. The tests were made by the contact method, the readings being taken after one hr. at room temp. The results of the reactions are tabulated for beef, chicken, dog, guinea pig, horse, human, monkey, rabbit, rat, sheep, and swine, and show all lens solns. to react in the same way with beef, horse, sheep, and swine antiserums; further that none of these lens antiserums reacts with the blood serum of either the corresponding or any of the other species represented, and, conversely, that no antiserum reacts with any lens soln. The precipitin reactions of the lens of the animals mentioned are lens specific, and the lens does not appear to contain any species-specific precipitinogen; hence the lens protein may be regarded as chemically distinct and as identical in diverse species.

L. W. RIGGS

Basal metabolic rate in hyperthyroidism. WALTER M. BOOTHBY. *J. Am. Med. Assoc.* **77**, 252-5(1921).—“The basal metabolic rate serves as an accurate diagnostic aid in the recognition of the presence or absence of hyperthyroidism.” L. W. RIGGS

Blood sugar and basal metabolism. R. A. MCBRAYER. *J. Am. Med. Assoc.* **77**, 861-3(1921).—Conclusion: “The detns. of basal metabolic rate and blood sugar are of no practical value in the differential diagnosis of chronic pulmonary tuberculosis and hyperthyroidism.” L. W. RIGGS

Further studies on the mechanism of the so-called Abderhalden reaction. E. ABDERHALDEN. *Fermentforschung* **4**, 338-58(1921).—A repetition of the expts. of Plaut and of Ewald, both of whom observed positive ninhydrin reactions, after the addition of inert materials to blood, gave negative results. More confirmatory evidence was found in support of A.’s idea concerning protective ferment. Several new methods of attack have been devised which are giving promising results. One consists in subjecting organ sections to the action of serum and then examining them for changes microscopically.

R. L. STEHLE

Experimental observations upon the effect of cholesterolemia on the results of the Wassermann test. CHARLES F. CRAIG AND WILLIAM C. WILLIAMS. *Am. J. Syphilis* **5**, 392-400(1921).—The effect of an increased blood cholesterol upon the Wassermann reaction was detd. experimentally in the rabbit. Normal, Wassermann-negative rabbits were given 1.25 g. per kg. of body wt. of cholesterol by mouth each day for a period of 18 days. The sera were tested for fixation (antihuman system with cholesterolized human heart antigen) on the 9th, 18th and 30th days. In no instance was a positive fixation obtained, in spite of the fact that the amt. of cholesterol in the blood had increased from 117.6 mg. (normal) to 961.5 mg. per 100 cc. of serum. G. H. S.

Flocculation reactions in syphilis: with especial reference to the Meinicke and Sachs-Georgi reactions. S. A. LEVINSON. *Am. J. Syphilis* **5**, 414-38(1921).—Flocculation reactions in general, and particularly those of Meinicke and Sachs-Georgi, shown by positive syphilitic sera are of essentially the same nature as the Wassermann reaction being dependent upon the formation of Wassermann aggregates. Study of these reactions throws much light upon the changes which take place in the seroglobulins in

syphilis and which render the reactions specific. The flocculation results from the union of the lipoidal antigen with the serum globulins, the degree of flocculation depending upon the concn. of globulin. The amt. of globulin present is to be correlated with the degree of irritation of the tissue cells induced by the *Treponema pallidum*. However, in certain conditions other than syphilis the serum globulins are increased and yet flocculation does not occur. Apparently in syphilis there is a second factor, the elaboration of a sp. *Treponema pallidum* toxin, and this toxin must combine with, or sensitize, the increased globulin before the latter will present an increased affinity for the particles of the lipoid ext. The function of the electrolyte and of the electrochem. affinity of the syphilitic globulin for the lipoidal ext. are of importance in the mechanism of the flocculation phenomenon. Of the flocculation reactions, that of Sachs-Georgi appears to be the most trustworthy.

G. H. S.

Attempt to detect thyroid secretion in blood obtained from the glands of individuals with exophthalmic goiter and other conditions involving the thyroid. J. M. ROGOR AND H. GOLDBLATT. Western Reserve Univ. and Lakeside Hospital. *J. Pharmacol.* 17, 473-80 (1921).—Blood was obtained from thyroid glands of 10 individuals upon whom thyroideectomy was performed for exophthalmic goiter, 3 for thyroid adenoma and 2 colloid goiter and tested for the thyroid secretion, the "tadpole reaction" being utilized. No evidence was obtained, in any of the specimens, of the presence of active thyroid material in the blood.

C. J. WEST

H—PHARMACOLOGY

ALFRED N. RICHARDS

Clinical and experimental notes on the anaphylactic bronchial asthma of fur dyers. H. CURSCHMANN. Univ. Rostock. *Münch. med. Wochschr.* 68, 195-7 (1921).—After a shorter or longer occupation with ursol, a fur dye worker may become hypersensitive to it, getting ill even when handling furs which have been treated with ursol. The most striking symptom is severe asthma. Ursol is formed on oxidation of *p*-phenylenediamine to quinone with transition to imine and polymerization. Various forms of ursol exist. Expts. were made with freshly prep'd. solns. of quinone diimine. Guinea pigs received injections of serum from a case of ursol asthma and after a lapse of one or more days intravenous as well subcutaneous injections of the imine soln. as well as inhalations. The intravenous injection and inhalations produced severe anaphylactic reactions, much less the subcutaneous injection. The serum of the patient was more toxic than normal serum. Two animals received a first injection of the imine and 18 or 16 days later an intravenous injection. Severe shock was noted, a drop of temp. to 34°, and rather quick recovery. Subcutaneous re-injection gave only little shock. These expts. are taken as proof that quinone diimine produces asthma not by virtue of primary toxicity but anaphylaxis. The anaphylactic shock could be avoided by previous administration of Ca.

S. AMBERG

Further notes about ursol injuries in fur workers RITTER. *Münch. med. Wochschr.* 68, 333 (1921).—Ursol may produce a not insignificant inflammation of the pharynx and of the entrance to the larynx.

S. AMBERG

The influence of disintegration products of cells on pharmacological reactions. H. FREUND AND R. GOTTLIEB. Univ. Heidelberg. *Münch. med. Wochschr.* 68, 383-5 (1921).—Very interesting theoretical discussion based on such observations as that blood platelet destruction yields solns. of marked pharmacol. activity. Products of cell destruction exercise a marked influence on the reactivity of autonomous organs to epinephrine, substances belonging to the digitalis group, atropine and other poisons.

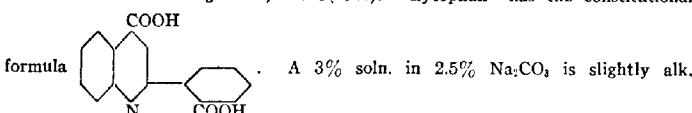
S. AMBERG

Chloroform narcosis and the adrenals. A. PITINI. *Gazz. degli ospedali* 41, 415 (1920); *Endocrinology* 4, 438.—After narcosis with CHCl_3 the content of adrenaline in

the adrenal glands is diminished. Perhaps the high blood pressure in the beginning of narcosis and the low pressure during the rest of the period may be explained in this way, that first the chromaffin system is stimulated and produces more adrenaline. This would be followed by an exhaustion of the chromaffin system. The suggestion is offered that injections of adrenaline are of use in narcosis. H. W. BANKS, 3D

Industrial poisonings and their prevention. ERNST BREZINA. *Chem. Ztg.* **45**, 599-602, 624-6, 647-9, 694-6 (1921).—An extended lecture on individual toxicology, covering many inorg. and org. poisoning agents, symptoms, tests, methods of treatment, means for prevention, statistics and bibliography. W. C. EBARTH

"Lytophan" a phenylquinoline dicarboxylic acid. F. GUDZENT AND JOH. KRIE. Univ. Berlin. *Ther. Gegen.* **62**, 127-9 (1921).—"Lytophan" has the constitutional



to litmus. Such solns. were administered to animals, as follows without appreciable effect: Frogs, wt. 25 g., in amts. equiv. to 15-30 mg. acid, ventral lymph sac; rabbits, wt. 1.8 kg. in amts. equiv. to 0.5-1.0 g. acid, subcutaneously; rabbits, wt. 1.76 kg., in amts. equiv. to 2.4 g. acid, subcutaneously, divided into 4 doses during day; dogs, wt. 6-7 kg., amts. equiv. to 5.9-12 g. acid, by mouth. One dog received 12 g. and vomited 6 hrs. later; another received 24 g. and had very little appetite the next day. Apparently, the substance is much less toxic than Starkenstein (*C. A.* **14**, 3270) found phenyleinchonic acid to be. Administration of 3-4 g. daily on 2 successive days increased the uric acid excretion in 3 out of 4 patients. The effect on blood uric acid (Maase-Zondck method) was not definite. One patient with arthritis deformans received a total of 60 g. in 8 weeks with favorable results. Other favorable results were obtained in 14 out of 21 patients with gout, migraine, rheumatism, etc. The other 7 patients did not respond to this treatment.

I. GREENWALD

A possible source of lead poisoning. A. F. G. CADENHEAD AND A. G. JACQUES. *Can. Chem. Met.* **5**, 260 (1921).—The object of the expts. was to demonstrate whether Pb accidentally mixed with smoking tobacco is carried over in the smoke. By duplicating the conditions present in pipe smoking it was proved that a very small proportion of Pb would be inhaled but most of it remains in the ash and tar as Pb and PbO .

H. C. HAMILTON

The pharmacological action of isoamylhydrocupreine (eucupine) and isoöctylhydrocupreine (vuzin). R. MAGNUS AND U. G. BIJLSMA. Utrecht Univ. *Proc. Acad. Sci. Amsterdam* **23**, 481-5 (1921).—This concise report includes results by subcutaneous, intravenous, and intramuscular injections; perfusion expts.; the action as antiseptics and disinfectants; the action on the nerves, the exposed heart, the corpuscles, the cornea, the blood vessels. A bibliography and detailed expts. are to appear later. H. C. H.

Experimental contribution to the theory of narcosis. I. TRAUBE AND P. KLEIN. Tech. Hochschule Charlottenburg. *Biochem. Z.* **120**, 111-24 (1921).—Studies with the Tyndall ions and the ultramicroscope showed that many substances which are sol. with difficulty in H_2O , such as the alkyl halides, the higher alcs., etc., are in part at least in the colloidal state when in satd. or concd. H_2O soln. This fact holds also for substances of low solv. in solvents other than H_2O , such as H_2O in C_6H_6 . The apparent discrepancies in surface activities exhibited by narcotics such as the alkyl halides, etc., on stalagmometric detn. is attributable to the incompleteness of their dispersion. Further studies with atropine and the relatively insol. nonylic acid showed that they can be obtained in a surface-active and a surface-inactive form according to their degree

of dispersion. When only large submicrons are present the surface forces of the solns. appear to be inactive as detd. by the stalagmometric method. When these are changed to amicron size by various means they appear to take on surface activity. Indifferent colloids could not be changed in this manner. An application to these findings of Gibb's principle is discussed. Compds. such as C_6H_6 are particularly colloidal in nature and on this fact depends their adsorption by charcoal. Studies of cataphoresis showed that the colloidal particles of nonyllic and caprylic acids and the bases aniline, toluidine, xylidine go to the anode while the base quinoline goes to the cathode. H_2O solns. of colloid materials as well as suspensions are irreversibly flocculated if surface-active nonconductors are added to satn.

F. S. HAMMETT

The active strength of the narcotics. I. Studies on the isolated frog heart. H. FÜHNER. Univ. Königsberg i. Pr. *Biochem. Z.* 120, 143-63 (1921).—Observations are given of the action on the frog heart of 40 compds., some halogen-free and some contg. halogen, in iso-narcotic concn. with 7% EtOH. The drop count of the narcotic dilns. was detd. Alcohol, paraaldehyde, acetone and Et_2O were found to have a high surface tension in narcotic concns. The esters influenced surface tension of H_2O to a lesser degree, not only in narcotic concn. but also in satd. H_2O soln. In general the narcotic action of the various compds. ran parallel with their H_2O or salt soln. solv.

F. S. HAMMETT

Acceleration of blood coagulation by euphyllin. R. MEISSNER. Univ. Breslau. *Biochem. Z.* 120, 197-202 (1921).—A presentation of exptl. data leading to the opinion that in the hastening of the coagulation of blood by euphyllin both the diamine and the purine groups participate.

F. S. HAMMETT

The action of some chloroform derivatives with particular reference to Traube's theory of the action of the narcotics of the methane series. GEORG JOACHIMOGLU. Univ. Berlin. *Biochem. Z.* 120, 203-11 (1921).—J. aims to demonstrate, by comparative data drawn from expts. on the effects of various Cl compds. of the methane series on the frog heart and yeast fermentation, that Traube's theory of the action of narcotics based on surface tension properties has no foundation in fact.

F. S. HAMMETT

Studies of the manner of kidney function by means of colloidal metals. J. VOIGT. (Göttingen) AND M. FRITZ (Wildungen). *Biochem. Z.* 120, 303-18 (1921).—Colloidal $AgCl$, Cu, Bi, Mn, Fe, Au, Ag and AgI were injected into dogs and the histological appearance of the kidneys was studied by the usual methods and the dark-field illumination. Of particular importance, however, was the common occurrence of a boundary zone in the medulla at which the metal deposition was markedly diminished. The assumption that all the tubules are not active at the same time, but that according to the need a greater or lesser part of them is involved in activity, is not uniformly supported by the evidence. Finally, attention is called to the fact that in a large number of the expts. there took place a sort of desquamative catarrh in which the epithelium loaded with metallic particles gave the appearance of being cast off for excretion. Since Ag was found in the urine only after an interval of 8 days from the time of injection it is presumed that the excretion of intravenously injected colloidal metals by the kidneys takes place in such a manner that it leaves the body together with the cast-off cells.

F. S. HAMMETT

The pharmacological action of colloidal arsenic sulfide. E. MENEGHETTI. Univ. Padua. *Biochem. Z.* 121, 1-39 (1921).—When colloidal As_2S_3 is administered by any method it is changed into the granular form and more rapidly than are the colloidal sulfides of other metals, such as Hg, Cu or Pb. This change in dispersion is considered significant in the production of the pharmacol. effects observed. Although no fixation in the cells can be found after oral ingestion of the compd. yet absorption is retarded. If As_2S_3 is injected subcutaneously or intramuscularly it is found fixed in the tissues

in small particles. The difference in effects produced by the compd. given in the colloidal condition and as a solid is attributed to the greater surface of the former. On intravenous injection the quick onset of the phenomena is laid to the mechanical effect of aggregation which produces small emboli in the lung and other capillaries. Death may follow large doses on this account. The significance of non-lethal doses of As_2S_3 in lung diseases is discussed.

F. S. HAMMETT

The ion equilibrium of the cell. A contribution to the physiology of sodium. S. G. ZONDEK. Univ. Berlin. *Biochem. Z.* 121, 87–108(1921).—Studies of the effects of various ions on the activity of the heart lead Z. to the opinion that osmotic relations have only a subordinate role in the phenomena elicited. The osmotic effect of NaCl is based in last analysis on the specific action of the Na ion, although osmotic effect and NaCl effect do not run a parallel course. The Na effect is closely related to the Ca and K action. Ca is an antagonist to K as well as to Na. There is no special effect on the heart of the nonelectrolytes, sucrose, glucose or urea. The normal heart function is dependent on a certain equil. between the Na, K and Ca ions, disturbance of the equil. leading to disturbance of function. Nevertheless, the heart can adjust itself to a new equil., either increased or decreased Na concn. or an ion-free condition.

F. S. H.

The secretory stimulative effect on the pancreas of the amino acid hydrochlorides. M. ARAI. Tokyo. *Biochem. Z.* 121, 175–9(1921).—Five to 10 cc. of aq. solns. of various concns. of the HCl salt of glycocoll, *d*-alanine, *d*-glutamic acid and glycylglycine were injected into the duodenum of dogs with temporary pancreatic fistula. Pancreatic secretion was stimulated. Histidine-HCl and *d*-glucosamine-HCl did not act as stimulants. When the compds. were injected intravenously or subcutaneously no reaction was obtained. Adrenaline depressed the stimulating action of these amino acid hydrochlorides.

F. S. HAMMETT

Curative action of radium on chicken sarcoma. II. OZATA. *Gann.* 12, No. 4, 49(1918); *Jap. Med. Literature* 5, 19(1920).—When extirpated tumor tissue was subjected to feeble radiation from Ra, then inoculated, its growth was stimulated. On the other hand strong radiation prior to inoculation temporarily retarded growth. A single radiation *in situ* of an inoculated fragment of tumor produced no gross change in size, but gave rise to a degeneration of the cell nuclei proportional to the amt. of the radiation. Repeated radiation stopped the growth of the tumor, and even produced a decrease in size, disintegration of the nuclei, round cell infiltration, necrosis, mucoid degeneration, and proliferation of the connective tissue.

JOSEPH S. HEPBURN

Acute yellow atrophy of the liver and the fatty infiltration of the liver and kidney which results from the action of certain poisons on the liver. ALEXANDER G. R. FOULKETON. *J. Path. Bact.* 24, 257–71(1921).—The effect of the following poisons on the liver was studied: Arsenobenzene, diphenylchloroarsine, $HgCl_2$, tarter emetic, As_2O_3 , AsH_3 , α - $NH_2C_6H_4OH$ and saponin. Most of them have a special affinity for fats. This explains the damage to the liver and the resulting, defective fat metabolism. The poison is fixed in the circulating food fat, and carried with it to the liver where it produces hepatitis. The excessive concn. of As in the adrenals suggests that it has an affinity for fats other than the glycerides of the higher fatty acids. This affinity for fats may be due in some instances to the fat-solvent power of the poison, in others to the formation of oleates. The latter is probably true for As, Hg, and P.

JOHN T. MYERS

The antiseptic action of some aromatic fumes. D. I. MACHT AND W. M. KUNKEL. Johns Hopkins Univ. *Proc. Soc. Expl. Biol. Med.* 18, 68–70(1921).—The fumes produced by the burning or destructive dry distn. of gums and spices such as gum galbanum, gum olibanum, cinnamon and saffron tend to exert an antiseptic action on the bacteria studied, *B. coli* and *B. pyocyanous cureau*.

V. C. MEYERS

A pharmacodynamic analysis of cocaine action of the cerebrum. D. I. MACHT

AND W. BLOOM. Johns Hopkins Univ. *Proc. Soc. Exptl. Biol. Med.* **18**, 81-2(1920).—Cocaine exerts a depressant action on the intelligent behavior of albino rats; in no cases even after minute doses of the alkaloid was there a primary stimulation noted; the various components into which the cocaine mol. can be split when injected individually or as a simple mixt. of each other do not cause the same action as their chem. combination in the form of cocaine. V. C. MYERS

Generalized infection in syphilitic rabbits resulting from the inadequate arsphenamine therapy. J. BRONFENBRENNER AND M. J. SCHLESINGER. Harvard Univ. Med. Sch. *Proc. Soc. Exptl. Biol. Med.* **18**, 94-5(1920).—Rabbits with expt. syphilitic orchitis when injected with small doses of salvarsan developed generalized infection, whereas controls treated with large amts. or those left untreated showed no such tendency. V. C. MYERS

Comparative study of ethanol, caffeine and nicotine on behavior of albino rats. D. I. MACHT AND W. BLOOM. Johns Hopkins Univ. *Proc. Soc. Exptl. Biol. Med.* **18**, 99-100(1921).—EtOH, caffeine and nicotine, when injected in sufficient amts. into albino rats, produced depression of behavior, as measured in the circular maze test. V. C. MYERS

Acidosis from capillary poisons. G. B. WALLACE AND E. J. PELLINI. Univ. and Bellevue Hosp. Med. Coll. *Proc. Soc. Exptl. Biol. Med.* **18**, 115-17(1921).—Uranium, cantharidin, arsenic, and diphtheria toxin cause widespread capillary damage, and bring about acidosis in dogs. Podophyllotoxin and emetine affect only the intestinal capillaries, and cause no acidosis. Hydrazine affects only the liver, and causes no acidosis. Histamine, if injected intravenously, produces acidosis. Marked damage to the liver and intestine fails to induce acidosis, and the kidney is not a necessary factor. The condition essential may be injury to the muscle capillaries. V. C. MYERS

Theoretical considerations bearing upon the chemotherapy of arsenical compounds. G. W. RAIZISS, J. F. SCHAMBERG AND J. A. KOLMER. Dermatological Research Lab., Philadelphia. *Proc. Soc. Exptl. Biol. Med.* **18**, 149-51(1921).—The toxicity as well as the curative power of organic arseno compds. is dependent to a considerable extent upon whether the amino groups are free or substituted. V. C. MYERS

Pharmacological examination of cinnamein, benzyl succinate and benzyl nitrite. D. I. MACHT. Johns Hopkins Univ. *Proc. Soc. Exptl. Biol. Med.* **18**, 177-9 (1921).—Cinnamein produces much the same effects as benzyl benzoate, but is much more irritant to the stomach and is more toxic to animals. Benzyl succinate, a solid, produces typical benzyl effects on smooth muscle, but more slowly and to a much lesser extent. Benzyl nitrite lowers blood pressure and is of value in hypertension. V. C. MYERS

The pharmacology of acetone. W. SALANT AND N. KLEITMAN. Univ. Georgia. *Proc. Soc. Exptl. Biol. Med.* **18**, 202-4(1921).—Acetone injected intravenously into cats and dogs produced a marked fall of blood pressure owing to cardiac depression. Recovery was prompt. Acetone was found to depress heart action in the expts. on the isolated heart of the frog and turtle. The vagus center was affected by acetone, as heart action became much slower. More pronounced effects on respiration were noted: in cats prolonged periods of apnea were observed after moderate amts. of acetone were injected intravenously; the depressing effect was less marked in dogs. V. C. MYERS

Preliminary note on chemical changes in the blood of syphilitics under arsphenamine treatment. C. WEISS AND A. CORSON. Dermatological Research Inst., Phila. *Proc. Soc. Exptl. Biol. Med.* **18**, 210-13(1921).—Increases in urea N, non-protein N and sugar in blood were noted after injections of arsphenamine into 2 syphilitics, who showed normal findings before the injections. V. C. MYERS

Chemical stimulation of the annelid nerve cord. A. R. MOORE. Rutgers Col.

Proc. Soc. Exptl. Biol. Med. **18**, 213-4(1921).—KCl, BaCl₂, and Na citrate, each in M/8 concn., gave marked excitation of the nerve cord of the earthworm; camphor and strychnine, each in satd. soln. and picrotoxin crystals, and M/64 Et₄NCl gave excitation, but phenol, nicotine and creatine had no effect, used either as crystals or in soln.

V. C. MYERS

Comparative study of ethanol, caffeine and nicotine on the development of frog larvae. D. I. MACHT AND W. BLOOM. Johns Hopkins Univ. *Proc. Soc. Exptl. Biol. Med.* **18**, 241-2(1921).—The effect of certain poisons was noted on larvae after hatching and on older tadpoles. Young tadpoles succumbed more quickly to all the poisons than the older ones. Nicotine was most toxic, caffeine came next, and EtOH was least toxic.

V. C. MYERS

Studies on the action of mercury. W. SALANT AND N. KLEITMAN. Univ. Georgia. *Proc. Soc. Exptl. Biol. Med.* **18**, 249-50(1921).—Small doses of Hg (as the benzoate, succinate and acetate) when injected intravenously into dogs and cats produced stimulation of respiration and usually a temporary rise in blood pressure; larger doses, however, and repeated small doses produced the opposite effect, the latter indicating cumulation. A long latent period of 2 to 6 minutes often preceded the sudden fall in blood pressure.

V. C. MYERS

The toxicity of skatole. W. SALANT AND N. KLEITMAN. *Proc. Soc. Exptl. Biol. Med.* **18**, 251(1921).—Skatole in acetone soln. injected into the ventral lymph sac of frogs produced severe intoxication in a few minutes; slow respiration, loss of reflexes, and muscular weakness were followed by paralysis and death. Acetone alone produced similar but much less pronounced symptoms. In cats and dogs, skatole produced a marked fall in blood pressure with slow recovery.

V. C. MYERS

Arsphenamine and certain other organic arsenic compounds (ROTH) 17. Malted barley and hordenine (GARRIGUES) 16.

I—ZOOLOGY

R. A. GORTNER

How the hypertonic solution acts in experimental parthenogenesis (method of Loeb). I. Origin and significance of the accessory asters. MAURICE HERLANT. *Arch. zool. expt. gén.* **57**, 511-33(1918); *Botan. Abstracts* **4**, 97-8.—Hypertonic solns. cause artificial parthenogenesis in sea-urchin eggs by providing accessory asters. Monasters produced in activated eggs before application of hypertonic soln. are ineffective; accessory asters make efficacious bipolar mitosis possible. Capacity of soln. for causing development of eggs depends on concn. and compn., NaCl, KCl, and OH ions favor accessory asters; CaCl₂ and MgCl₂ are neutral or inhibitory; H ions, KCN, and anesthetics prevent cytasters. Agents alter permeability of egg membrane. Cytasters are produced artificially only during period of permeability of egg membrane. H. suggests that salts penetrate the egg at this time, become irregularly distributed in the egg, and "salted" spots become centers of coagulation and liquefaction of colloids, thus forming asters. **II. The mechanism of segmentation.** *Ibid* **58**, 291-314(1919); *Botan. Abstracts* **4**, 98.—Egg of *Paracentrotus lividus* stimulated to development by butyric acid alone forms monaster or several monasters one after another at successively shorter intervals and of successively shorter duration, but the egg does not divide. Nucleus disappears while monasters are present but reappears, each time of larger vol., after each monaster, and toward the end of the series monasters it may be fragmented. In eggs treated first with butyric acid, then returned to sea water, and finally for 30 mins. to hypertonic soln., accessory asters are formed in addition to aster near nucleus. Aster is a physiol., not morphological phenomenon. Review of literature indicates most features of mitosis are largely independent of each other, and none is indispensable.

H. G.

Dissection and injection studies on the ameba. R. CHAMBERS. Cornell Univ. Med. Col. *Proc. Soc. Exptl. Biol. Med.* **18**, 66-8(1920).—Oils injected into *Ameba proteus* form spherical droplets which are carried about in the cytoplasmic currents. A large drop is usually expelled. Dstd. or spring H₂O diffuses through the granular endosarc dilg. it, and finally accumulating on 1 side of the *Ameba* in the form of a blister which is ultimately pinched off. By injection of acid indicators it was seen that the protoplasm is more acid than its environment. "Basic" dyes have a coagulating and "acid" dyes a liquefying effect on the protoplasm. Dissection indicates that the granular endosarc is easily changed between the fluid and solid states. Peripheral to the endosarc is a hyaline liquid zone, the ectosarc, bounded externally by a thin pellicle, which softens in a localized area in the formation of a pseudopod. V. C. MYERS

A volatile sperm-stimulating substance derived from marine eggs. G. H. A. CLOWES AND E. BACHMAN. Marine Biol. Lab., Woods Hole. *Proc. Soc. Exptl. Biol. Med.* **18**, 120-1(1921).—Sea-urchin eggs suspended in sea H₂O secrete a sperm-stimulating substance, which is non-specific and is a simple, volatile, organic substance, a product of enzymatic action or fermentation within the cell. It is weakened by heating with acid, unaffected by heating in neutral or alk. soln., rapidly destroyed by oxidizing agents.

V. C. MYERS

Researches on the nutrition of the silk worm. EIKIJI HIRATSUKA. *Bull. Imperial Sericultural Expt. Sta.* **1**, 257-315(1920).—Silk worms consume an av. of 13 kg. mulberry leaf per 1000 worms per day, or from 12 to 65% of the standard quantity allowed them. That part of the leaf consumed contains the least amt. of fiber and ash and is rich in protein and N-free extractive substances. The female worm consumes more food than the male. The period of max. voracity occurs in the 5th instar (age), but the amt. of food ingested relative to the wt. of the body is less than in the earlier instars. The av. digestibility of the nutrients of the mulberry leaf are as follows: dry matter 40.92%, N-free ext. 36.85, crude fat 58.72, carbohydrates 40.52, crude protein 62.23, ash (1st-4th instars) 32.68, ash (5th instar) 8.57, crude fiber 0.71%. The digestibility of dry matter tends to decline as the age increases; the values for protein, fat and carbohydrate are, however, higher in the 5th instar than in the 3rd and 4th, while the rate of retention of ash is much lower in the 5th because of the discharge of a large amt. of phosphorus and alkalies toward the end of this stage. The digestive juice of the silk worm contains no cellulose-decomp. enzyme and since the digestive tract is almost bacteria-free, there is no breaking down of the fiber of the leaves. The digestibility of food is generally large in the period of great voracity of the 5th instar; in the maturation period succeeding this, the digestibility of N-free extract is a little lower while that of protein and fat is about the same. The excretion of ash is greatly increased. The female shows a higher value of digestibility of food than the male. The digestible part of the mulberry leaf has about the same % of fat as the leaves as a whole; the amt. of protein is large, that of ash small and there is almost no fiber. The nutritive coeff. (ratio of crude protein to the sum of the crude fat and N-free ext.) of the digestible part of the leaf is somewhat higher in the 5th than in the preceding instars. The greatest tissue building activity occurs during the 1st instar, the quantity of stored material in 24 hrs. being 3.7 times the initial wt. This becomes less as age advances. The amts. of food ingested and digested requisite for the formation of a given amt. of body tissue show no significant difference from 1st-4th instars, but a marked increase in the 5th. The quantity of dry matter, however, does not increase because the water content of the newly formed tissues of the 5th instar is much less than in preceding stages. 157.2 g. dry matter of the digested food are necessary for the formation of 100 g. solid body tissue, consisting of 74.6 g. carbohydrate and 68.8 g. protein. Some carbohydrate is transformed to fat and stored as such. Protein is important in the 5th instar in

the formation of body tissue, silk substance, etc., carbohydrate in the storage of fat and glycogen and as food for the maintenance of life. Ash is important up to and in the early part of the 5th instar. The female worm requires more food for the building of a given amt. of body tissue than the male, except fat. The male worm accumulates more fat than carbohydrate, the female more carbohydrate than fat. The bodies of the male chrysalis and moth are poorer in carbohydrate and richer in fat than those of the female. The quantity of cast-off skins is 25.52 g. per 1000 larvae or 2.2% of the dry matter digested in all instars. An av. of 240.33 g. silk (dry wt.) is secreted per 1000 larvae, corresponding to 25% of dry matter digested and 65% of the N digested during the 5th instar. The male produces less silk than the female, but at a higher relative rate to the ingested and digested food and body substance of the matured worm. 1000 female moths lay 391.09 g. eggs (135.55 g. dry basis), equivalent to about one-half the body substance (77% of the body glycogen). The av. quantity of dry body substance consumed to supply bodily energy is as follows: Eating period, 8.08 g. per 1 kg. (dry basis) body wt. per hr.; moulting period, 4.64 g.; pupal period, 0.29 g.; moth period, 3.21 g. The heat value of the mulberry leaves supplied to the worms increases as the age of the worms increases; that part which is eaten has a higher value and the physiol. available portion of the latter has a still higher heat value. The heat value of the worm is high at the time of hatching, decreases when feeding commences and gradually rises up to the chrysalis and moth stages. The heat value is lower at the end of the moulting periods than during them; male worms show higher values than female. The av. amt. of physiol. available energy corresponds to 42.02% of the energy ingested. During the 5th instar, the amt. of available energy is greatest at the time of great voracity, but is much less in the later maturation period. The female worm has a larger amt. of physiol. available energy than the male. The av. amt. of energy stored for the building of tissue corresponds to 67.31% of the sum of the physiol. available energy and 28.3% of the ingested energy; the amt. of stored energy of each instar is 63.99% av. of the available energy of the respective instar. The female stores more energy than the male, but relatively less compared with the amt. of available energy. 2.11% of the available energy is lost as cast-off skin during the moults; 23.57% of the available energy of the 5th instar is lost as silk. One part of silk requires 5.1 parts physiol. available energy or 12 parts of ingested energy for its production. The female secretes more silk substance than the male, but the latter produces silk at a higher rate against the energy obtained, the physiol. available energy and the energy stored as body substance, of the mature worms. 12.6% of the available energy of all stages is lost as eggs. 34.66% of the physiol. available energy is consumed for the support of the living state; after moulting 17.75% of the available energy of all instars is consumed. The female always consumes more energy than the male.

CHARLES H. RICHARDSON

The rate of growth of the domestic fowl. SAMUEL BRODY. Mo. Agr. Expt. Sta. *J. Gen. Physiol.* 3, 765-70 (1921).—The growth period of the domestic fowl is similar to that of mammals, being composed of 3-4 cycles, 2 postembryonic with maxima at 8 and 12 weeks and 2 or at least one embryonic cycles with max. at 11-12 and 15-16 days. Hatching occurs during the second or third cycle as in the guinea pig. The velocity curves of each of these cycles can be represented by the equation of an auto-catalytic monomol. reaction. Cf. *C. A.* 15, 2477. CHAS. H. RICHARDSON

12—FOODS

W. D. BIGELOW AND A. E. STEVENSON

Microscopic examination of flour. G. L. KEENAN AND M. A. LYONS. U. S. Dept. Agr., *Bull.* 839, 32 pp. (1920). E. J. C.

Analysis of alimentary pastes; so-called "pastes with eggs" (noodles). ERNEST

MARTIN. *Mon. sci.* 11, 151-2(1921).—A method is proposed to detect eggs in pastes and det. their quantity. *Albumin*.—Make a dough of 30 g. of ground paste, which passed 60-mesh sieve, with 15 cc. H₂O in a mortar. Knead the dough in hands over a funnel in a 500-cc. graduated flask under rapidly dripping distd. H₂O, starch being washed from the gluten. Mix the contents of the flask and filter (folded paper), the first cloudy portion being discarded. To 250 cc. of filtrate add 2 drops AcOH and boil in a 400-cc. flask. If egg white is present a characteristic turbidity develops. Long boiling, the H₂O which is evapd. being replaced, coagulates albumin, which can be filtered on tared paper, washed with boiling H₂O, dried in oven and weighed. Pastes containing no egg give a slight ppt. which is 1.3-2.0 g. per kg. Pastes contg. 3 eggs per kg. give 9.66-10.00 g. of albumin, the theoretical being 11.88. Drying pastes which normally contain 8-10% H₂O in an oven at 100-105° did not affect the albumin or change the limit of content indicated. *Lecithin*.—Ext. 50 g. of ground paste in a Soxhlet app. for at least 36 hrs. with equal mixt. of alc. and Et₂O. Evap. the solvent, dry and weigh. Saponify with strong alc. KOH and evap. to dryness. Ext. with hot H₂O, decompose the soap with slight excess of HNO₃, boil, filter on wet paper to sep. fat, wash (with boiling H₂O), evap. to 50 cc. and add several crystals of KMnO₄ to liberate H₃PO₄. Prolonged boiling disposes of the MnO₂ formed. Ppt. with molybdate at 65° on H₂O bath. Paste contg. neither eggs nor yolk give 0.07-0.08 g. P₂O₅ per kg. while those with 3 yolks per kg. give 0.24-0.31 g. per kg. Table of analyses of pastes with different quantities of eggs is given.

H. A. LEPPER

Degree of preservation of dried cod fish. A. VERDA AND U. EMMA. *Schweiz. Apoth. Ztg.* 59, 247-9, 258-61(1921).—The investigation involved extn. of the finely powdered sample (30 g.) with 500 cc. H₂O at a low temp. for a period of 15 to 20 hrs., after which the product was filtered. On the addition of 2 cc. Nessler's reagent to 50 cc. of the filtrate (contg. sol. proteins and their decompn. products), a faint lemon-yellow color with a slight flocculent turbidity (well-preserved sample) resulted, while in the case of more or less advanced decompn. an orange-yellow color obtained together with a quickly agglomerating ppt. A prime dried codfish contains about 2.49% coagulable protein, 5.039% albumose, 3.16% fish bases but no NH₃, while in more or less decomposed stock the protein and albumose values are depressed with a corresponding increase in the N bases and the formation of NH₃.

W. O. E.

The preparation of a soluble protein extract from soy beans. S. A. WAKSMAN. N. Jersey Agr. Expt. Sta. *Proc. Soc. Exptl. Biol. Med.* 18, 219-20(1921).—By using soy-bean cake in the growth of certain fungi, the enzymes present in the mycelium act upon the proteins, causing over 50% of them to go into soln. When concd., this soln. has 45% sol. proteins and protein digestion products and is quite rich in vitamines, while practically free from carbohydrate. This may be of value in feeding infants and diabetics.

V. C. MYERS

The adulteration of bread by the addition of water. ARPIN. *Ann. Jals.* 13, 545-8(1920).—The bread-making qualities of flour depend mainly on its moisture content, gluten content, and absorbent power of the gluten. With a given flour, there is a max. and a min. amt. of H₂O which can be used to obtain a good quality of bread. If less is used, the bread does not rise properly, and if too much is used the dough cannot be properly handled. Baking expts. were carried out with 2 flours using on each, max., min., and intermediate amts. of water. The greatest difference in the moisture contents of the bread (exclusive of the crust) from the same flour was 3.06% and the difference between the greatest and least yields was 2.90%. It follows that the baker cannot add an unlimited amt. of water to his flour, and the variations which he can make are such that a bread of good quality will never contain more than 45-8% H₂O (when made from flour prep'd. from French wheats).

A. P.-C.

The milk of the city of Montpellier. E. HUGUES, Chef des Travaux à la Station Oenologique de Montpellier. *Ann. fals.* 12, 272-82, 351-6 (1920).—A large number of analyses are given (and commented on) both of the mixed milks and of individual milks taken over a period of 10 mos. (June 1913—March 1914 inclusive) in 3 well-kept and reputable dairies in Montpellier.

A. P.-C.

The milk of the city of Montpellier. PIERRE DEFRAANCE, Montpellier. *Ann. fals.* 13, 146-50 (1920); cf. preceding abstract.—D. compares Hugues' results with those of 70 analyses carried out by himself (published in 1908) on milks from 55 dairies in Montpellier, and comments on the differences between the two sets of results.

A. P.-C.

Dried milk as a food. R. J. BLACKHAM. *J. Roy. Sanitary Inst.* 41, 84-94 (1921).—There are five varieties of dried milk on the market: (1) Dried sepd. milk, contg. an av. of 1% fat, (2) dried half-cream milk, averaging 15% fat, (3) dried three-quarter cream milk, contg. about 20% fat, (4) "Government" standard dried milk, corresponding to the 3% standard of the Board of Agriculture and Fisheries, (5) full cream milk made from whole fresh milk, which averages 27% fat. 95-96% is a high degree of solv. to obtain in any dried milk. The effects of drying on milk constituents are: Fats are no longer in emulsion, but in a condition resembling butter and quite granular. When mixed with water the fat globules are considerably fewer and much larger than in fresh milk. Albumin and globulin are coagulated, but caseinogen is not. The protein content is more digestible than in fresh milk. The milk sugar is unchanged. Ferments are all destroyed but Lane-Claypon has shown that this loss is of no importance as regards the value of dried milk for hand-feeding of infants. Fat-sol. A is not affected by heat. Water-sol. B stands desiccation. Water-sol. C is largely diminished in the prepn. of dried milk (according to expts. at the Lister Inst., Hess, Fisk, Unger and others demonstrate that there is no diminution of this factor). Analyses made in the Government Lab. by Sir James Dobbie gave: A. Full cream (26 samples), water, 1.80 to 6.10; fat, 22.58 to 31.28; protein, 22.70 to 27.75; lactose, 33.26 to 41.39; ash, 5.44 to 7.58. B. Part cream (7 samples), water, 5.00 to 6.50; fat, 4.73 to 21.92; protein, 25.01 to 32.25; lactose, 39.28 to 49.57; ash, 6.40 to 7.80. C. Skimmed milk (50 samples), water, 2.29 to 10.87; fat, 0.067 to 3.4; protein, 30.69 to 37.23; lactose, 45.65 to 52.58; ash, 7.00 to 9.66. The literature shows that the fact that milk has been heated does not rob it of its power to convey the tubercle bacillus. Tests of a dozen samples showed neither pathogenic bacteria nor any organisms of the coli group. The only organism isolated was the harmless *Bacillus subtilis*. The use of dried milk as an infants' food, also as a food for adults and invalids, is discussed.

NATHAN VAN PATTEN

Study of several methods for the detection of watering of milk. URTZ. *Z. angew. Chem.* 34, Aufsatzteil, 21-2 (1921).—In the abstract of this paper in *C. A.* 15, 1766 the word "not" was omitted in the printing by error in the sentence which starts "The method of Sanfelici, etc." This method is not recommended for practice. E. J. C.

The sampling of milk. H. F. JUDKINS. Mass Agr. College. *J. Dairy Sci.* 4, 350-4 (1921).—Comparison was made of samples taken and tested daily for 2 mo. from 12 deliveries with composite samples taken with the milk thief and with a small dipper twice a month. Tests were also taken on the 15th and 30th and on the 10th, 20th and 30th of each month and divided by 2 and 3, resp., to get the monthly av. The dipper and tube methods seem to be practically equally accurate as methods of sampling when samples are tested every 2 weeks and daily deliveries of milk do not vary much in wt. Adding up 3 tests and dividing by 3 comes so near results obtained by daily testing that it is worthy of recommendation. The only other alternative is to run composite samples and test every 2 weeks.

H. A. LEPPER

The determination of lactose in adulterated milks and in sweetened condensed

milk. L. LEGRANDE. *Le Lait* 1, 218-20(1921).—To det. lactose in the presence of other reducing sugars use is made of Barfoed's reagent, which is Cu acetate in dil. AcOH soln. Although the values for lactose by this method are somewhat less than by polarimetry they are sufficiently close for safety. The above reagent is employed first, when values for glucose, galactose and fructose are obtained directly; a Fehling's detn. conducted upon the same sample before inversion gives the total reducing sugars. The difference between the former and the latter detn. when corrected will give the quantity of lactose. Cf. *C. A.* 15, 1675. H. F. ZOLLER

Use of aluminium in dairying. E. DROUILLY. *Le Lait* 1, 228-42(1921).—After a seemingly exhaustive study of the effect of lactic acid on Al, Trillat concludes that it is without effect and that the other constituents of milk in the natural state are without effect. The mechanical features of pure Al render it valuable in the manuf. of Al milk bottles and other containers for dairy products. A number of dairies in France have given Al milk bottles a thorough trial and they have given promise of fulfilling the need for a more merchantable container than glass. It is necessary to fashion them of Al alone since the continued contact of other metals is likely to develop into electrolytic action and to the consequent deterioration of the article. Special designs of articles to increase their stability are considered. H. F. ZOLLER

The relation of acidity to the coagulation temperature of evaporated milk. I. A. ROGERS, E. F. DEYSHER AND F. R. EVANS. Dairy Division, U. S. Dept. Agric. *J. Dairy Sci.* 4, 294-309(1921).—The relation of the acid-base ratio to the coagulation temp. of evapd. milk and the influence of the H-ion concn. on this temp. were studied. Results did not show any very definite relation between the acid-base ratio of the raw milk and the coagulatory point of the evapd. milk under com. conditons. Exact information in regard to the relation of the mineral constituents of the milk would be of little value in detg. its suitability for condensing purposes. Results obtained from detg. H-ion concn. electrometrically indicate that there is no definite relation between the true acidity of the fresh milk and the coagulating point after evapn. This indicates that the detn. of titratable acidity in fresh milk is of little value for grading purposes. It is not possible to draw a definite limit in H-ion concn. above which milk would be unsuitable for evapg. as the value varies within wide limits. Other factors than increased acidity are of equal or greater importance on the coagulating point. A very small increase in the acidity from the normal for any particular milk will cause a distinct lowering of the coagulating temp. of that milk evapd. H. A. LEPPER

New angles to the starter-maker's problem. B. W. HAMMER. Iowa State College. *J. Dairy Sci.* 4, 277-85(1921).—Starters made with *S. lacticus* alone gave a much lower volatile acidity even after a considerable number of transfers than those made with mixts. of this organism with *S. citrovorus* or *S. paracitrovorus*. The volatile acidities of mixts. were in general the same as with good starters. A com. culture after varying numbers of transfers gave high volatile acid in both sterilized and pasteurized milk. *S. citrovorus* and *S. paracitrovorus* have a definite restraining action on growth of *S. lacticus*. Starters are not pure cultures of *S. lacticus*. *S. citrovorus* does not grow at 37° while *S. paracitrovorus* does. Good starters must contain at least 2 organisms. A delicate balance between the 2 is necessary if the aroma- and flavor-producing materials are to be developed in proper amts. H. A. LEPPER

Lactic fermentation. I. E. KAYSER. *Le Lait* 1, 184-91(1921).—A masterly review of the field of lactic organism culture. It treats fully of Jensen's and Weigmann's classification from the point of view of the dairy industry. Carbohydrate and N metabolism are considered. II. *Ibid* 242-9.—The influence of temp. on the growth of lactic organisms is shown by dividing them into 3 groups on the basis of their optimum temps. The first group whose optimum lies between 32° and 38°; the second between

40° and 50°, and the third between 12° and 15°. The effect of air upon the relative proportions of volatile and non-volatile acids is discussed. The non-volatile acids formed during lactic fermentation are lactic (levo and dextro or the equiv. mixt. of each) and succinic together with more or less of the volatile acetic, formic, propionic and carbonic acids. Some space is given to the views of Jensen and Pére on the relation between enzyme specificity and the stereometric configuration of the sugar mol. and the consequent production of active or inactive lactic acid by the organisms. It is possible to differentiate between certain classes of lactic organisms by their ability to reduce certain dyes, notably litmus, methylene blue, indigo, etc. Many other important features of the metabolism and habitat of these organisms are discussed such as enzyme production, thermal death point, lactic diastase, salt sensibility and toxicity. H. F. ZOLLER

Sandy crystals in ice cream: their separation and identification. HARPER F. ZOLLER AND OWEN E. WILLIAMS. Bur. Animal Industry. *J. Agr. Research* 21, 791-5(1921).—Lactose was shown to be the cause of "sandiness" in ice cream. The isolated sandy crystals averaged 99.86% lactose. The form of lactose appearing in ice cream is the normal α crystal form which crystallizes from H_2O solns. in tomahawk-shaped prisms and from protein solns. in more rugged or maize-shaped crystals. Several photomicrographs are shown.

F. C. COOK

Reliability of the nail test for predicting the chemical composition of green sweet corn. C. O. APPLEMAN. Maryland Agr. Expt. Sta. *J. Agr. Research* 21, 817-20 (1921).—The thumb nail is thrust into the kernel and if the exudate is milky the corn is said to be in the milky or best edible stage. If the exudate is cloudy or opalescent, but not white and milky, the corn is in the premilk stage. In the early dough stage a little pressure by the nail is required to force out the creamy contents which also contain a little dough. In the dough stage only dough is forced out of the kernels by the nail and the kernels are commencing to show considerable yellow color. Expts. were undertaken with Stowell's Evergreen corn to det. within what limits the chem. compn. of the corn can be predicted by the nail test. Corn in the 4 stages enumerated above was tested and analyzed. An early and a late crop were studied. Starch, total sugars and H_2O were detd. for the 4 stages of ripeness for both crops, and the max. and min. data are recorded. The compn. of the kernels for each stage of the late crop was much more uniform than for the corresponding stage of the early crop. The % of starch in both the milk and early dough stages was lower in the late than in the early crop. In each of the ripening stages, except the dough stages, the % of total sugar was more const. than the % of starch. As ripening progressed the increase in % of starch was much greater than could be accounted for by the decrease in % of sugar. From the beginning of kernel formation until the end of the ripening period there is a continual movement of sugar from the plant into the kernels where it is transformed into starch. The reliability of the nail test is influenced by the rate of ripening and also by the rate of H_2O lost by evapn. The test is more reliable when applied to crops which ripen slowly in the cool autumn. F. C. COOK

The microscopical examination of Yerba maté. A. C. SCALA. *Anal. asoc. quím. Argentina* 9, 192-5(1921).—An illustrated description of the structures found in powdered maté leaves and the common adulterants. L. E. GILSON

Some new factors in the production of silage. ANON. Wis. Agr. Expt. Sta., *Bull.* 319, 41-2(1920).—Brief mention is made of work on the bacteriology of silage by E. G. Hastings. The first organism which appears in any number in silage is one of the colon group. It produces CO_2 , acids in small amts. and from 0.6 to 0.7% of alc. R. M. J.

Bacteriological and chemical studies of different kinds of silage. CHARLES A. HUNTER. Pa. Agr. Expt. Sta. *J. Agr. Research* 21, 767-89(1921).—The nature of the fermentation taking place in silage composed of a mixt. of silage crops was studied.

Both field and lab. tests were made. The total number of microorganisms, the total acid producers, the colon-aerogenes group, *B. Bulgaricus*, the yeasts and the protein digesters were counted. Total acidity, volatile acidity, amino N, ammonia N, albuminoid N, and H₂O were detd. The field tests consisted of the following:—Canada field pea and oat silage (2 tests), corn silage and corn and soy-bean silage. Concrete silos were used. Three lab. tests were made with Canada field pea and oat silage *viz.* (1) Untreated, (2) treated with 2% CHCl₃, and (3) sterilized and inoculated. Graphs of the findings are presented. Little differences were found in the fermentations taking place in silage composed of Canada field peas and oats, corn and soy beans and corn only. A larger number of *B. Bulgaricus* organisms were found in the corn silage than in the other types of silage studied. The production of acid was due to microorganisms. With the exception of the first few days yeasts had little influence upon the fermentation. Plant enzymes were chiefly responsible for the hydrolysis of protein with the formation of amino N. The formation of NH₃ was due to both enzymes and microorganisms.

F. C. COOK

Experiments with dairy products at the Wisconsin Station. ANON. Wisconsin Agr. Expt. Sta., *Bull.* 319, 43-4 (1920).—It was found that the titratable acidity of milk is not an indication of its coagulability when sterilized, and that condenseries are, therefore, not justified in refusing milk of high acidity. Coagulation is due primarily to an excess of Ca salts, and any tendency to coagulate can be readily corrected by the addition of suitable citrates or phosphates. The lack of flavor in Cheddar cheese made from pasteurized milk was overcome by adding a special starter which in addition to lactic acid bacteria contains organisms isolated from soil and feces.

R. M. J.

Analysis of ensiled alfalfa and discussion of its food value. P. LAVENIR AND A. CHAUDET. *Anales soc. quim. Argentina* 8, 327-30 (1920).—In general, ensiled alfalfa has an acid reaction. Some specimens were found where fermentation had gone to an extreme with production of free NH₃ by degradation of the nitrogenous substances present. Analyses of typical samples with an acid reaction showed that some degradation had occurred, as 75% of the nitrogen content was found to be present in the form of water-sol. compds. consisting almost entirely of amino acids. The food value of these amino acids is questioned.

L. E. GILSON

The change in the hydrogen-ion concentration of various mediums during heating in soft and pyrex glass tubes (ESTY, CATHCART) 11C. Differentiation of type A and type B botulinus toxins in food (GRAHAM, Schwarze) 11C. Nature of hardening of vegetable plants (ROSA) 11D.

Flavoring extracts containing higher alcohols. B. H. SMITH and J. R. EOFF, JR. U. S. 1,384,680, July 12. Flavoring exts. are prep'd. by dissolving flavoring materials such as orange oil, lemon oil or vanilla ext. in higher ales., *e. g.*, isopropyl alc. U. S. 1,384,681 relates to the use of glycols as vehicles for flavoring exts., *e. g.*, ethylene or propylene glycol.

13—GENERAL INDUSTRIAL CHEMISTRY

HARLAN S. MINER

The Jugo Slavonic chemical industry. KURT ZIELENZIGER. *Z. angew. Chem.* 1921, No. 54 (*Chem. Ind.* 44, 310-11).

E. J. C.

Research in industry. L. A. HAWKINS. *J. Soc. Automotive Engineers* 9, 20-2 (1921).—An address.

C. J. WEST

Thermodynamics and its application to the chemical industry. G. URBAIN.

Chimie et industrie 3, 750-60(1919); 4, 31-42(1920).—U. gives first a general outline of the laws of chemistry as related to thermodynamics. Among the subjects discussed are the law of mass action, Carnot's cycle, catalysis, reactions at high temps., the phase rule and chem. potential. The second paper takes up the application of the above laws and theories to industrial work, illustrating such application with a few certain cases. These are represented by the application of the phase rule to the *Stassfurt deposits* and to the manuf. of *H* by steam and *Fe*. U. also takes up taylorism as applied in France. The theory and application of thermodynamics to the manuf. of H_2SO_4 by the contact process is discussed in detail.

P. D. V. MANNING

Industrial raw materials in China. TAKETORA ANO. *J. Chem. Ind. (Japan)* 23, 782-8(1920).—The raw materials in China which have direct bearing on Japanese chem. industry are considered under 5 headings: minerals, agricultural products, live stock, marine products, and forest products. Important minerals are *Fe* (1 billion tons), *Sn*, coal, *Zn*, *Hg*, *W*, *Sb*, and petroleum oils. Cotton, fiber, vegetable oil, beans, rice, wheat and barley are agricultural products. Green hide, wools, various animal fats and bones are available from live stock. *NaCl* is the only noteworthy marine product. In forestry, essential oil, lacquer, lumber, and various drugs are essential products. Annual-production and extent of present development of these materials in China are given in detail.

S. T.

Presidential address, Montral, P. Q. WILLIAM POPE. *J. Soc. Chem. Ind.* 40, 179-82T(1921).—The production of rubber, camphor, quinine, etc., by works methods cannot compete successfully in cost of production with the natural products turned out by cheap labor and the free energy of sunshine in the tropics. Even indigo from the plant, if the same efforts had been expended upon plant improvement as upon lab. methods, would probably not find any difficulty in competing with the works-made product. Nature, however, generally furnishes us with but one member of any particular class of complex org. compds. The chem. technologist on the other hand has succeeded in mfg. a whole range of dyestuffs of the indigo family which do not occur among vegetable products. The productivity of tropical countries, for example, Malaya and the Fiji Islands, could be greatly increased by the eradication of certain widespread tropical diseases, such as hookworm, and their causes. Org. reactions employed in the lab. and works are changing their character, high potential energy is being superseded by low potential energy, and thus we are more nearly approximating the methods utilized by plants and animals in building up complex substances. Petroleum offers a fruitful field for research. At present it stands where coal tar once stood; it is considered only fit to burn. Also in *Chem. Age* (London) 5, 272-5(1921).

E. G. R. ARDAGH

Report on elimination of waste in industry. ANON. *Mech. Eng.* 43, 579-83(1921).—The Comm. authorized by the American Engineering Council and appointed by Herbert Hoover makes its Report in 3 sections: (I) A summary which includes a statement of the sources and causes of waste with recommendations for waste elimination; (II) the engineers' field reports in the 6 industries investigated; and (III) general reports on unemployment, strikes and lockouts, adjustment of disputes, accidents, health, eye conservation and purchasing and sales policies. The whole report contains about 130,000 words. This article deals only with section I which may be briefly summarized as follows: Six industries were studied (1) building, (2) men's ready-made clothing, (3) boot and shoe mfg., (4) printing, (5) metal trades and (6) textile mfg. The responsibility for prevention of waste is shown to be much greater for management than for labor. Waste due to low production, to interrupted production, to restricted production and to lost production is discussed under each of these headings. Recommendations for the elimination of waste are made to management, labor, the public, trade associations, the government and to engineers.

E. G. R. ARDAGH

Waste heat utilization for steam generation. G. R. McDERMOTT. *Assoc. Iron and Steel Elec. Eng.* 3, 293-319(1921); cf. *C. A.* 15, 1120.—The heat absorbed by radiation is proportional to the fourth power of the abs. temp. difference between the radiating surfaces. The temp. of waste heat gases being much lower than that produced by direct firing, specially designed boilers are necessary. McD. recommends fire tube boilers with numerous small flues for quite low temps., e. g., for the utilization of exhaust gases from large gas engines using coke oven and blast furnace gas. McD.'s own design calls for 476 1.5" flues 12' long, the total heating surface being approx. 1950 sq. ft. For further details of McD.'s boiler and for the discussion of the utilization of other sources of waste heat for steam generation in iron and steel plants the original must be consulted.

E. G. R. ARDACH

Combined electrical and steam power operation. ROBERT NITZSCHMANN. Aussig. *Chem. App.* 8, 117-20(1921).—A mathematical paper. Cf. Bechstein, *C. A.* 15, 1584.

J. H. MOORE

Concentration of water in steam boilers. VICTOR J. AZHE. *Power* 54, 46-8(1921).—Blowing down of boilers is generally a matter of guesswork. The limit of concn. of water-sol. salts is generally placed from 100 to 300 grains per gallon in the literature, whereas many boilers are being successfully operated on concns. as high as 2000 and 3000 grains per gallon. Priming is caused by matter both in suspension and in soln. The priming point varies with compn. of water, type of boiler and degree of overload. Precautions for taking samples to det. the degree of concn. are given. To det. boiler water concn. the NaCl method is most generally used; it consists in comparing the NaCl content of the boiler water sample with a carefully predet. ratio of NaCl to sol. salts. Add 1 drop of phenolphthalein to a 50-cc. sample and add 0.05*N* H₂SO₄ until the pink color disappears. Add 2 drops of K₂Cr₂O₇ and titrate with AgNO₃ (4.97 g. per l.). The end point is indicated by the persistence of a slight reddish ppt. Each cc. of AgNO₃ is equiv. to 2 grains of NaCl per gallon. The hydrometer method employs a hydrometer with graduations from 1.000 to 1.025, each division of 0.001 equaling 100 grains concentration per gallon. Accuracy of this method does not exceed 100 grains per gallon. The densimeter is an instrument recently patented by E. C. Walker. It consists of a short piece of glass tubing with a bulb at one end, properly sealed and calibrated. The densimeter bulb is placed in the hot water sample whose concn. is desired. The water is stirred with a thermometer and when the bulb rises from the bottom and touches the surface the temp. (°F.) is noted. The amt. of sol. salts in grains per gallon is found from a curve giving the relation between the "floating temperature" and dissolved mineral matter in water.

A. R. ALBOUZ

Electrical resistance materials. WALTER KENNEDY. *Assoc. Iron & Steel Elec. Eng.* 3, 241-7(1921).—K. reviews the various metals and alloys now used for elec. resistance purposes. In choosing a metal or alloy for any particular purpose the following items have to be taken into consideration: sp. resistance, temp. coeff., permissible working temp., m. p., mechanical properties, and cost. Cast Fe has a very high sp. resistance and is suitable for many purposes. At fairly high temp. Ni withstands oxidation better than Fe. For very high temp. in air the Ni-Cr alloys serve the best purpose. In using resistance grids ample air circulation must be provided for to avoid local overheating.

C. G. F.

Dehydration of transil oils by centrifugal force. C. H. HAPGOOD. *Elec. World* 78, 473(1921).—In the centrifugal oil purifier, the oil is drawn from the bottom of the transformer and pumped through an elec. heater to the top of the purifier. Moisture and dirt are removed by centrifugal force and the pure oil is pumped back to the top of the transformer. A portable outfit to effect this includes a pump and an elec. heater.

In one installation, a circulation for 145 min. at the rate of 375 gal. (1419 l.) per hr. increased the dielec. strength (using the new standard gap) from 13 to 20 kv. The character of the oil affects the capacity of the machine but not the thoroughness of dehydration. The purifier may be used for stationary service or mounted on a truck contg. all the necessary auxiliary equipment connected up for immediate use. The general construction is similar to that used to purify lubricating oils. W. H. BOYNTON

The heat pump and its application to the evaporation of water and aqueous solutions. H. CLAASSEN. *Z. angew. Chem.* **34**, Aufsatzteil, 233-5(1921).—The term "heat pump" is applied to the process of compressing the steam from an evaporator to a pressure equal to that of the heating steam in order to use it again as a source of heat. C. considers "The conditions for the operation of a heat pump," "power and steam consumption of a heat pump," "calcn. of the total steam consumption of evapg. plants with heat pumps," "derivation of the formula for calcg. the steam consumption," "comparative calcns. of the steam consumption and the H_2O evapd. in an example," and "the steam injector for compressing generated steam." He concludes that the heat pump effects no great economy unless there is either water- or hydro-elec. power available to operate it.

J. H. MOORE

Plauson's method for preparing colloids and its technical value. AUGUST CHWALA. *Oesterr. Chem. Ztg.* **24**, 107-9(1921); cf. *C. A.* **14**, 3129.—Further details of the construction and operation of Plauson's "colloid mill" are given. In order to produce a colloidal dispersion of a given substance it is milled with a suitable dispersion medium and peptizing agent. For a given substance and dispersion medium there exists a definite max. concn. of the sol form of the colloid, any excess remaining in the gel form. A number of industrial uses for the colloid mill are briefly outlined.

F. L. B.

Air pollution and wastefulness. FREDERIC DANNERTH. Newark, N. J. *Chem. Met. Eng.* **25**, 104(1921).—A recent decision of the U. S. Supreme Court is discussed in detail. The State of Wyoming passed an act which prohibits as wasteful the burning and consumption of natural gas for its products, without fully and actually, applying and utilizing its heat for other mfg. or domestic purposes. The case was originally heard in the U. S. District Court for Wyoming but the gas carbon black producers appealed to the U. S. S. Court for an injunction restraining the State of Wyoming from enforcing the law. The U. S. S. Court held that a state has a right to det. if any conservation is necessary and it also has the right to det. how far it wishes to go in exerting its power. In the hearings it was shown that 1000 cu. ft. of natural gas contains approx. from 33 to 45 lbs. of actual C. It was also shown that the companies operating these gas wells obtain only 1.75 lbs. of C per 1000 cu. ft. of gas. A process carried on with an efficiency of less than 5% was considered to be highly wasteful. The court emphasized the fact that possession of the land is not necessarily possession of the gas as the property of the owner of lands in oil and gas is not absolute until it is actually in his grasp and brought to the surface. Oil and gas have no fixed situs under a particular portion of the earth's surface within the area where they obtain.

F. D.

Innovations in the mechanical operation of above-ground plants at mines. LWOWSKI. *Z. Ver. deut. Ing.* **65**, 830-43(1921).—Hoisting plants are discussed. The discussion also covers boiler plants for high pressure, superheated steam, tubular boilers, mechanical stokers, powdered coal firing, travelling grates, feed-water heaters, lime-soda and permuteite water softeners, Cumberland process (use of counter-e. m. f. at 6 to 10 v.) for protecting boilers from electrolysis and keeping them free from scale, water feed devices, etc.

W. C. EBAUGH

The control of furnaces; apparatus used in furnace control. PAUL FRION. *Bull. soc. encour. ind. nat.* **133**, 553-75(1921).—A lecture by the director of "l'Office central de Chaudron rationnelle," in which the following conclusions are reached: (1) Only by

careful furnace control can the max. efficiency be attained in industrial heating-app. (2) Such control is based upon the scientific study of the heat losses in the app. (3) The control can be obtained only by the use of precise measuring instruments in the hands of skilled engineers.

T. S. CARSWELL

Accidents in factories and workshops. ANON. *Chem. Age* (London) 5, 156-8 (1921).—Notes on dangers in machinery and processes are quoted from the annual report of the Chief Inspector of Factories & Workshops. Dangers and precautions are given for the use of abrasive wheels, hydro extractors and centrifuges, and fatal explosions and their causes are discussed in the cases of gasoline, tank repair work, and acetylene installations. $KClO_4$ is more stable than $KClO_3$, but mixed with org. matter it will detonate when struck with a hammer. A fatal explosion in a $KClO_4$ crystg. room shows the necessity of a dust-free air supply for compressors. A plenum system of direct air supply for rooms contg. dangerous or noxious fumes creates dense fume pockets unless the velocity of the air is limited.

W. H. BOYNTON

Procedures involving annulment of patents and granting of compulsory licenses. JULIUS EPHRAIM. *Z. angew. Chem.* 34, Aufsatzeil, 240-2 (1921).—A detailed explanation as to practice in (German) patent law, emphasizing the essential differences in procedures involved.

W. C. EBAUGH

Inventions and processes. WILHELM POLLMANN. *Chem. Ztg.* 45, 817-8 (1921).—Comments on advertising inventors, process-sellers, formula mongers, incompetent consultants, so-called engineers, promoters, etc., pointing out how business ought *not* to be done, and recommending the employment of a "business attorney" or technical adviser of the highest rank.

W. C. EBAUGH

Liability of a railroad for spontaneous combustion of a shipment. W. BROD-BECK. *Chem. Ztg.* 45, 820-1 (1921).—A discussion of responsibility of a (German) railway for loss of goods inherently dangerous. In the case of friction matches, for example, it must be shown that the company was at fault in handling goods with unnecessary roughness or lack of care.

W. C. EBAUGH

The measurement of color (MEES) 2. Industrial poisonings and their prevention (BREZINA) 11H.

Lubricating oil. J. F. MALONEY. U. S. 1,384,703, July 12. A lubricating mixt. adapted for use on vehicle springs is formed of paraffin lubricating oil 50 gals., lubricating graphite 15 lbs., ether 1.5 gals., acetone 30 gals., turpentine 5 gals., kerosene 15 gals. and creosote 50 gals.

Metal packing. W. L. HARRIS. U. S. 1,383,943, July 5. A metal packing for use where exposed to heat is formed of finely divided metal alloy 85, asbestos 6, grease 3, mica 1 and metal wool 6 parts. The metal used may be an alloy of Pb 82-95, Sb 2-14 and Sn 1-4%.

Valve-Packing Grease. E. C. Weisberger. U. S. 1,384,714, July 12. A grease adapted for packing valves is formed of tallow 25 lbs., soap 1 lb., beeswax 1 lb. and "neutral oil" 1 gal.

14—WATER, SEWAGE AND SANITATION

EDWARD BARTOW

Some problems encountered in waterworks engineering (and discussion). W. C. HAWLEY. *Proc. Soc. Western Penn.* 37, 87-114 (1921).—General and specific water engineering problems are discussed.

G. C. BAKER

Control of public water supplies. M. Z. BLAIR. *Can. Eng.* 41, Aug. 4, 1921.—Recommends protection of surface supplies.

LANGDON PEARSE

Welland-Niagara district water-supply problem. F. A. DALLYN. *Can. Eng.* 40, June 30, July 7, 1921.—Outlines growth of area, water needs and recommends formation of water district. **LANGDON PEARSE**

Underground water supply of Buckinghamshire and Hertfordshire. W. WHITAKER. *Water and Water Eng.* 23, 281-2(1921).—From a study of the underground supplies of Buckinghamshire and Hertfordshire, W. concludes that one of the main sources of underground water is chalk, rivaled only by sandstone of the Midlands. The underground flow is independent of the surface slope and comes from joints and bedding planes rather than from the chalk itself. **G. C. BAKER**

The Birkenhead new water supply. ANON. *Engineering* 112, 286-8(1921).—This is an engineering description of the new Birkenhead Eng. water supply. **M. F.**

Comprehensive water works plan for Cedar Rapids. BURNS & McDONNELL. *Eng. News-Record* 87, 187(1921).—The water supply of Cedar Rapids, Ia., is inadequate and it is proposed to move the plant across the river. As a temporary expedient, two 30-ft. diam. wooden coagulation and settling tanks and four 15 ft. diam. wooden filter units are recommended. The new plant will consist of mixing and coagulating basins, six 1½ mil. gal. per day filters and the necessary pumping equipment and appurtenances. Total cost of the plant is estd. at \$1,250,000. **FRANK BACHMAN**

Ground water for irrigation near Gage, Ellis County, Oklahoma. DAVID G. THOMPSON. U. S. Geol. Survey, *Water-Supply Paper* 500-B, 33-53(1921).—This report applies to a region within a radius of 15 or 20 miles from Gage. Logs of deep wells drilled for oil were studied and the conclusion was reached "that there is no reasonable prospect of obtaining water for irrigation in this region, except in small areas." The water from deep wells would be costly to pump and is so charged with dissolved salts as to be unsuitable for irrigation purposes. Analyses of 4 samples showed all unfit for use in boilers, though 3 of the wells were less than 160 ft. deep. The 4th well, 516 ft. deep, contained 6200 parts per million of dissolved solids, and was therefore unfit for domestic use or irrigation. Specializing in crops adapted to a small rainfall is suggested in place of irrigation. **L. W. RIGGS**

Modern methods of water supply and purification. II. M. F. SANBORN. *Am. City* 25, 143-9(1921); *Public Health Eng. Absts.* Sept. 24, 1921.—A brief résumé is given of treatment and purification of water supplies by slow sand, mechanical and drifting sand filters, and of water softening and disinfection and algae treatment. **G. C. BAKER**

Water-supply-cross-connection rules of Ontario Board of Health. ANON. *Eng. News Record* 87, 374(1921).—A connection may be maintained between a fire-protection system and a municipal water supply, and every such connection shall be protected with dual check valves of approved type. **FRANK BACHMANN**

Water works cross-connections at Hartford, Conn. GEORGE W. GOETHALS. *Eng. News Record* 87, 409-11(1921).—A report favors the use of an improved type of double check valve to protect the public health. **FRANK BACHMANN**

Preliminary note on the purification of water by activated silt. GILBERT J. FOWLER AND R. R. DEO. *J. Indian Inst. Sci.* 4, 149-57(1921).—Various samples of silt collected from streams of China and India, which were subject to pollution, were tested. Activated silt was prepared by making a thin paste of silt with water, mixing with 3 times the amt. of water and aerating. Nitrifying organisms were introduced by adding sewage effluent along with the saline constituents of Winogradski soln. to assist their development. To this soln. $(\text{NH}_4)_2\text{SO}_4$ was added and air bubbled through. Daily detns. showed that the NH_3 disappears more rapidly than the nitrite N, thus indicating the intermediate formation of hydroxylamine. When using 0.1 part ammoniacal N per 100,000, 90% of the NH_3 was oxidized in 24 hrs. Polluted water was added and

with 6 hrs. aeration 75% of the ammoniacal N and 60% of the O-consuming power were removed. Treatment of filter effluent together with coagulation with $Al_2(SO_4)_3$ gave a percentage increase in the purification of 30-40% with free and saline NH_3 , 20-30% with albuminoid NH_3 , and 20% in the case of absorbed O. With more thorough mixing even better results were obtained. Activated silt settles very rapidly and suggests improvements in the technic of water purification and has a bearing on the effect of the discharge into streams. Precautions must be observed since a certain accumulation of activated silt may actually tend to pollute, bacteriologically at any rate, a water of high quality.

G. C. BAKER

The purification of waste waters (and sewage) by clay. A. A. BADO AND T. J. RUMI. *Anales soc. quim. Argentina* **8**, 132-7(1920).—Some of the org. matter in the water is adsorbed by the clay and some of the Fe of the clay goes into soln. The water becomes less putrescible. Exptl. data are given.

L. E. GILSON

Water purification at Government reservation at Perryville, Md. ANON. *Eng. Contr.* **56**, 38(1921).—Raw water from the Susquehanna River is pumped to settling tanks with about 0.6 grain per gal. of $Al_2(SO_4)_3$. After 2 hrs. it goes to rapid filters. Bacteria are reduced from 2,630 to 1 per cc. on average.

LANGDON PEARSE

New Mobile water purification unit. *Military Engr.*, July 1921; *Eng. Contr.* **56**, 142(1921).

LANGDON PEARSE

The uses of lime in water purification. C. ARTHUR BROWN. *Munic. & County Eng.* **61**, 109-111(1921).—The use of lime has developed since 1902, providing a softening effect.

LANGDON PEARSE

Chemical and biological survey of the waters of Illinois. ANON. *Ill. State Water Survey Bull.* No. **16**, 9-20(1918-19).—A history and the duties of the department are outlined, followed by a tabulation of the samples of water examd. during the yrs. 1918-19. Of all samples analyzed $\frac{1}{4}$ were condemned from dug wells and $\frac{1}{4}$ from drilled wells, while 71% of the samples from wells less than 25 ft. and only 14% about 100 ft. were condemned. Some of the deeper wells were condemned not on account of pollution but because of the high mineral content. A larger proportion was condemned during summer months than winter. The character of the well waters examd. is not representative of all well waters of the State, as by far the greater number of samples was sent in because of suspected contamination; samples analyzed from wells not suspected showed a much higher degree of purity. Field investigations and scientific and special studies are included.

G. C. BAKER

Hardness of Illinois municipal water supplies. ANON. *Ill. State Water Survey Bull.* No. **16**, 77-90(1918-19).—Tabulations show the compn. of the mineral matter, hardness, and the amts. of lime and soda ash required, with approx. costs, to soften the water from wells of 338 municipalities. Analyses of waters from streams used for municipal supplies are not included, owing to varying compn. Data show that Ill. waters are quite hard, 186 samples showing a hardness of from 300 to 600 p. p. m., while only 1 showed a hardness of less than 100, 7 less than 200 and 38 less than 300. Fifty eight had a residue of from 600 to 1000 p. p. m., 57 from 1000 to 2000, 11 from 2000 to 3000, 5 from 3000 to 4000, and 1 from 4000 to 5000. Methods of calcn. are given.

G. C. B.

Quality of water in the Sangamon River. MINNA E. JEWELL. *Ill. State Water Survey Bull.* No. **16**, 230-46(1918-19).—A survey of the biological and chem. conditions shows that the water of the Sangamon River above Decatur is in good condition but below Decatur is grossly polluted, especially during the low waters of early fall. Also in *Public Works* **51**, 252-3(1921).

G. C. BAKER

A waterworks laboratory. R. E. GREENFIELD. *Ill. State Water Survey Bull.* No. **8**, 136(1910); No. **16**, 249-52(1918-19); *Eng. Contr.* **56**, 266-7(1921).—A list of app. for chem. and bacteriol. analysis is recommended.

G. C. BAKER

Elimination of tastes in water at Marquette, Michigan. W. C. BROCKWAY. *Eng. News-Record* 87, 72-3(1921).—Contamination of the water supply of Marquette by waste products from the manuf. of MeOH imparted objectionable tastes to the supply. The most troublesome tarry waste will be evapd. to 25% of its vol. and the residue used as liquid fuel.

FRANK BACHMANN

Lead poisoning and water supplies. J. F. READE. *Water and Water Eng.*, March 21, 1921; *Eng. Contr.* 55, 632-3(1921).—Lead poisoning in water is due to a soln. of Pb in acid waters, from peaty areas. Treatment is usually by adding powdered chalk, lime, or Na_2CO_3 to water.

LANGDON PEARSE

Further observations on ρ_{H} in natural waters. ABEL WOLMAN AND FRANK HANNAN. *Chem. Met. Eng.* 25, 502-6(1921); cf. *C. A.* 15, 1955.—The authors discuss the formula $[\text{H}^+] = K \sqrt{P \times [\text{Ca}^{++}]}$ for waters in equil. both with the partial pressure (P) of the CO_2 of the atm. and calcite, where K is a const. depending upon the temp. ρ_{H} values show marked seasonal as well as daily changes, which in turn are influenced in a secondary manner by biological contamination. These delicate fluctuations are not detected by the usual titrations for alkalinity. Filtration produces a temporary change in the ρ_{H} , and the ρ_{H} of the medium being filtered, as well as the polyvalent coagulation ions is fundamentally a controlling mechanism. It is more difficult to obtain good filtration in summer owing to a higher ρ_{H} . The remedy is an increased dosage of alum, which reduces the ρ_{H} . Efficiency of the action of chlorination may be dependent upon the ρ_{H} .

G. C. BAKER

Calculation and determination of the content of active carbonic acid in potable water. I. M. KOLTHOFF. Utrecht. *Z. Nahr. Genussm.* 41, 97-112(1921).—See *C. A.* 15, 284.

D. B. DILL

Color in water: its nature and removal. JOSEPH RACE. *J. Soc. Chem. Ind.* 40, 159-62T(1921).—An historical review leads up to the discussion of the essential relation ρ_{H} to color removal as developed in expts. on Ottawa River water, wherein it is shown that the isoelec. point of coloring matter is approx. identical with this H-ion concn., the zero point of methyl red, and that max. color removal can be obtained by the max. concn. of electrolyte, $\text{Al}_2(\text{SO}_4)_3$, that can be added without changing the disperse phase. Expts. in color removal by electrolysis with a current of 4-6 v. through submerged Al plates gave results of scientific if not practical interest, showing that the colloidal matter causing color is mostly attributable to humic acid and its salts.

W. F. MONFORT

Detection of phenols in water. WELLINGTON DONALDSON. *J. Ind. Eng. Chem.* 13, 848(1921).—A correction conferring due credit is offered to Scott's paper (cf. *C. A.* 15, 2821). Additional criticisms are given.

G. C. BAKER

Estimation of dissolved oxygen in water. REINALDO VANOSSI. *Anales asoc. quim. Argentina* 9, 96-120(1921).—A review of methods. The original Winkler iodometric method is discussed in detail.

L. E. GILSON

A new sampler for collecting dissolved oxygen samples. R. E. GREENFIELD AND F. L. MICKLE. *Ill. State Water Survey Bull.* No. 16, 197-201(1918-19).—An app. improvised from lab. materials consists of a wide-mouth bottle of 1500-cc. capacity fitted with a No. 13 rubber stopper pierced with two holes, one near the center and the other on one side. A thin-walled brass tube, that can be inserted into a 250-cc. sample bottle, is placed in the center hole. This tube is cut off so as to be $1\frac{1}{4}$ in. shorter than the sample bottle and a shorter piece of the same tubing is inserted in the other hole and extends 2 in. above the stopper. A bent brass clamp, to hold the sample bottle, is attached to the stopper. The app. is attached to a stand heavy enough rapidly to sink it. Specifications are given for a metal sampler of practically the same design. This consists of a Cu box $3\frac{7}{8}$ in. square by 10 in. deep with a flat heavy flange riveted to the top. The cover, a square brass plate, is clamped to the flange by 4 clamps, and

carries the same arrangement of tubes and bottle-holding clamp as the original app. The sampler is weighted with Pb to make it sink properly. G. C. BAKER

Silicic acid—fluence and removal in water purification. OTTO M. SMITH. *Ill. State Water Survey Bull.* No. 16, 140-61 (1918-19).—See *C. A.* 14, 2227, 2831. G. C. B.

Turbidimetry of water. P. V. WELLS. *Am. Water Works Assoc.* 1921; *Eng. Contr.* 56, 46 (1921).—W. outlines the mathematical theory of reading turbidity. Cf. *C. A.* 15, 910. LANGDON PEARSE

The deterioration of Javel water. G. FILAudeau AND COLLINeAU. Lab. central du Ministère de l'agr. *Ann. fals.* 14, 197-203 (1921).—The loss in strength of Javel water seems to be proportional to the available Cl. The allowance of 2° Gay-Lussac (for a 12° water) permitted by the Fr. regulations seems quite sufficient for the ordinary waters of 12-5°; but for concd. solns. the approx. date of manuf. should be known before passing judgment. The addition of $K_2Cr_2O_7$ protects Javel water from the action of direct sunlight, the retrogression of a soln. thus treated being practically the same as when the soln. is kept in diffuse daylight. Temp. seems to have little or no effect. A. P.-C.

Problems in the chlorination of water. ANON. *Eng. News-Record* 87, 392-6, 444-6 (1921).—Answering a questionnaire, 17 water-works operators give experience on the effect of temp. on tastes and odors, and on corrosion of metals and efficiency factors. The general opinion was that cold-water troubles are due more, probably, to other factors than Cl although cold shows up the chem. reaction and theoretically smaller doses should be tasted. People become accustomed to slight tastes and odors or else get tired of complaining. No limit can be set on the amt. of residual Cl which will produce tastes. Corrosion has not been experienced except in 1 or 2 cases. Aiming at the Public Health Service standard is desirable, but not considered necessary. An algae-infected water requires more Cl than one without. FRANK BACHMANN

Dry feed for water-works chemicals. ANON. *Eng. Contr.* 56, 46 (1921).—A description of the Booth dry-feed app. LANGDON PEARSE

Chloramine and *Crenothrix*. W. F. MONTFORT AND O. A. BARNES. *Ill. State Water Survey Bull.* No. 16, 218-22 (1918-19); *J. Am. Water Works Assoc.* 6, 196 (1919).—Samples of water which contained *Crenothrix* when treated with 0.5, 0.75 and 1.0 p. p. m. available Cl in freshly prep'd. chloramine developed no growth within 6 months, while a similar sample treated with bleaching powder equiv. to 1 p. p. m. available Cl showed a velvety growth (*Crenothrix*) in 3 weeks and an abundant reddish growth in the control within a week. There were no objectionable tastes or odors in the chloramine-treated samples. Stability tests on chloramine were made and preps. were carried out with varying results. G. C. BAKER

Influence of minute quantities of metallic salts in water on its bacteriological content. E. L. ATKINSON AND R. C. FREDERICK. *J. Roy. Nav. Med. Service* (reprint) April, 1921; 5pp.—Natural waters of different types were treated with Pb acetate, Cu sulfate, $FeCl_3$, or $ZnSO_4$, equiv. to 0.5 and 0.25 pt. of metal per 100,000, and after inoculation with *B. typhosus* each sample was sub-cultured into ordinary nutrient broth tubes on 4 successive days. The results show that even 0.25 pt. of Cu per 100,000 in the water markedly inhibited development in the cultures; Zn had a slight effect at 0.5 pt. of 100,000 but practically none at 0.25 pt., while Pb and Fe at 0.5 pt. per 100,000 were without any appreciable action. In further expts. an upland surface water and a mixt. of shallow well and upland surface waters were treated with salts as above, and after standing for 48 hrs. were subjected to routine bacteriological analysis. Here again the results were seriously affected even by 0.1 pt. of Cu per 100,000 of water, and Pb and Zn at 0.5 pt. per 100,000 appeared to influence the results in some cases. The

authors conclude that a chem. analysis of water is necessary for the interpretation of the results of bacteriological tests. J. S. C. I.

Reducing the typhoid toll in W. Va. E. S. TISDALE. *Bull. W. Va. Bd. Health; Eng. Contr.* 56, 129(1921).—T. describes 19 outbreaks of typhoid, in which the use of Cl proved effective. LANGDON PEARSE

A new study of the Milwaukee water-supply situation. HARRISON P. EDDY. *Eng. News-Record* 87, 26-7(1921).—Immediate filtration of the water supply is recommended. Sewage works will reduce the av. load on the water filters but storm overflows are a menace. Typhoid has been greatly reduced but child mortality is higher than would be expected with an uncontaminated water. FRANK BACHMANN

Progress in malarial control. ANON. *Eng. Contr.* 56, 257(1921).—In Arkansas and Mississippi malaria can be reduced 75-95% at an annual *per capita* cost of 45-100 cents. LANGDON PEARSE

The efficacy of copper sulfate for destroying algae. ATILIO A. BADO. *Anales soc. quim. Argentina* 8, 14-17(1920).—The water supply of Buenos Aires is taken from the river La Plata. Two pts. per million of Cu sulfate added to the water prevents the growth of algae which during the warm season would choke the reservoirs and filters in a few days. L. E. GILSON

Bactericidal action of water treated by ultra-violet rays. W. F. WALKER AND R. W. PRYER. *Am. J. Pub. Health* 11, 703-6(1921).—The authors conclude that the exposure of water to ultra-violet light emitted from a quartz mercury vapor arc imparts to the water a definite residual bactericidal property which effects a reduction of at least 85% of the organisms subsequently added; that the ability to impart this property is dependent upon the energy input into the lamp and the time of exposure of the water; that the usual type of sterilizer operating on a 220-v. circuit develops the bactericidal properties under ordinary working conditions; and that this property is accentuated in series installations. NATHAN VAN PATTEN

Stream pollution in Michigan. W. C. BROCKWAY. *Public Health Michigan* 9, 214-220(1921); *Public Health Eng. Absts.* Sept. 24, 1921.—(1) Streams and bodies of water are being polluted by cities and industries to such an extent that serious conditions exist throughout the state. Fishing is being ruined. Water supplies are endangered and people have to put up with the offensive nuisances. Regarding remedies, there are 4 considerations: (a) The closing up of troublesome industries must be avoided for economic reasons. The Bur. of Sanitary Eng. believes that industries can dispose of their objectionable wastes satisfactorily without prohibitive financial burdens. (b) Suitable means of waste disposal or economic changes in or additions to mfg. processes must be devized which will eliminate the objectionable wastes. (c) Authority to force offenders to abate nuisances must be had. (d) The responsibility of disposing of wastes belongs entirely to private or public corporations producing them. G. C. BAKER

Oregon commercial fisheries code, 1921-22, Salem, Oregon. ANON. *Public Health Eng. Absts.* Sept. 24, 1921. G. C. BAKER

Experiments on the preservation of mud samples. MINNA E. JEWELL. *Ill. State Water Survey Bull.* No. 16, 206-7(1918-19).—Satisfactory preservation of mud samples for N detns. was obtained by adding a sufficient amt. of benzoic acid either with or without H_2SO_4 while H_2SO_4 alone gave an increase of ammonia N. G. C. BAKER

Notes on water filtration. GEORGE MITCHELL. *Proc. Inst. Water Eng.* (London) 1921, *Eng. Contr.* 56, 197-8(1921).—M. discusses slow sand filtration in England, and the use of preliminary filters. Rates at Aberdeen have been 3.5 m. g. d. per acre. Methods of cleaning are discussed. LANGDON PEARSE

Water filtration in Madras. J. W. MADELEY. *Proc. Inst. Water Eng.* (London) 1921; *Eng. Contr.* 56, 218-9(1921); cf. *C. A.* 15, 1178.—Madras has slow sand filters

which are to be supplemented by liquid Cl. Expts. are described on covers (results at 2 places contradictory) and thickness of sand (not less than 24 in.). **LANGDON PEARSE**

Filtration at Peterboro, Ont. *Can. Eng.* 40, June 30, 1921.—An engineering description of a 6-unit, 5-mil. gal. rapid filter. **LANGDON PEARSE**

Mechanical filtration plant being built in Cambridge. *GEORGE A. JOHNSON.* *Eng. News-Record* 87, 416-7(1921).—A 14-mil. gal. per day mechanical filter plant being constructed for Cambridge is the first of its kind to be built in Massachusetts. The plant includes a covered sedimentation basin, filters, aerating and chlorinating devices for the filtered water, a covered clear water basin, etc. The population in 1920 was 110,000. **FRANK BACHMANN**

Analytical data essential to run mechanical filters. *C. ARTHUR BROWN.* *Eng. News-Record* 87, 833(1921).—B. points out the necessity of reducing the number of tests to a minimum so that they can be carried on without undue burden. **F. B.**

Tuning up anew an eight-year-old filtration plant. *C. ARTHUR BROWN.* *Eng. News-Record* 87, 245-6(1921).—The water filter plant at Waco, Texas was built in 1913, and recently it was overhauled to bring it up to present-day practice. Owing to insufficient coagulation and imperfect sedimentation, the filters clogged rapidly, efficiency was lowered; mud balls formed, sand broke away from the side walls, etc. Recommendations were for proper mixt. of water and chemicals; use of dry feed machines to dispense chem. feed tanks; and renewal of sand and gravel in filters. **F. B.**

Compact filtration plant for Scarboro, Ont. *ANON.* *Can. Eng.; Eng. Contr.* 56, 125-6(1921).—An engineering description of rapid filters for a population of 5,000. **LANGDON PEARSE**

Old intermittent sand filtration plants in Conn. *J. F. JACKSON.* *Conference State Sanitary Engineers 1921; Eng. Contr.* 56, 42(1921).—At Meriden 11 acres handle an av. sewage flow of 3.9-mil. gal. per 24 hr. At Bristol 11 acres handle 2-mil. gal. Ample area was provided, 145 and 83.5 acres. resp. **LANGDON PEARSE**

Results produced by experimental baffles at Montebello filters of Baltimore Water Works. *J. W. ARMSTRONG.* *Munic. & County Eng.* 60, 254-62(1921).—Baffling improved the action of the basins. Details are given. *Ci. C. A.* 14, 2831. *L. P.*

Increasing the yield of an old filter plant. *C. H. CAFEN, JR.* *Public Health News* (N. J.) May 1921; *Eng. Contr.* 56, 37-8(1921).—A small plant (2-mil. gal. per 24 hrs.) was improved by cleaning the strainer system, and revizing the method of wash. *L. P.*

Trouble with Crustacea organism on filter beds. *H. ROSENTHAL.* *J. Am. Water Works Assoc.* 8, 530-1(1921); *Public Works* 51, 26(1921).—At Dallas, Crustacea interfered with filtration, until 0.5 to 0.7 p. m. liquid Cl were added before filtration. There was no further difficulty. **LANGDON PEARSE**

Water treatment for boilers. *J. S. SIMSOHN.* *Mech. Eng.* 43, 597-600, 606(1921).—The economy of water softening, and the adaptability of the Clark soda lime, zeolitic, combination zeolite and soda lime and distn. processes of water purification for boiler-feed waters are discussed. The accepted allowable concn. of Na_2SO_4 or NaCl at 200 lb. working pressure may reach 1000 grains per gal. without deposition. Corrosive waters, owing to the presence of weak acids formed by the decompn. of org. matter, hydrolysis of sol. salts as $\text{Ca}(\text{NO}_3)_2$, MgCl_2 and Fe which with MgO forms FeO , can usually be treated chemically. H_2CO_3 formed by the decompn. of org. matter is a common source of trouble. The unusual pressure of free caustic is explained by the formation from Na_2CO_3 of the formate, then the acetate, NaOH being liberated in each case. Free NaOH hastens boiler decay by liberating nascent H_2 , which enters into the iron structure and changes its phys. properties. A high Na_2CO_3 content, as in waters of high temporary hardness treated with zeolitic softeners, is to be avoided. Cylinder oil, for no evident reason, has been known to absorb excess caustic. **MARTIN FLENTJE**

Boiler-water treatment plants. ROBERT JUNE. *Blast Furnace Steel Plant* 9, 564-6(1921).—A general discussion of troubles resulting from the use of bad boiler-feed water and a classification of the elimination of impurities is given. The ideal purification plant should furnish a water free from bicarbonate, and impurities causing foaming, corrosion and scale formation. The feed lines and pumps should be free from deposits and there should be no undue wear on valves and moving parts, and no bad effects should result from steam carried over top rime movers, packing or lubrication, or to the product, if steam is used for industrial purposes. It should require a minimum of expert attention and only simple standard mechanical elements using standard reagents and indicators. Filters should not be required and the capacity should be unlimited and the costs low.

G. C. BAKER

Recent foreign developments in water treatment. J. H. BLAKELY. *Power Plant Eng.* 25, 950-2(1921).—To prevent corrosion in boilers the dissolved O is removed by passing the feed water over Fe turnings ("degassed"). For the purification of cooling water for surface condensers, HCl treatment ("vaccination" process) is applied to remove the carbonate before the water enters the condensers. Diagrams and working principles are given.

G. C. BAKER

Magnesium chloride in boiler-feed water. H. OSTR. *Z. angew. Chem.* 34, Aufsatzteil, 396-7(1921).—O. refers to articles (*Oester. Chem. Ztg.* 1902, 819, 845; 1903, 87) to disprove the theory of boiler corrosion, dependent on the formation of $MgClOH$ and HCl. His results show the amt. of the Fe_2O_3 formed depends on the amt. of dissolved salt present; and that the Fe tends to go into soln. in the presence of $MgCl_2$ and Mg_2SO_4 . The amts. of H_2 and SO_2 gas liberated prove the reactions to be $MgCl_2 + FeO(aq.) = FeCl_2 + MgO$; and $MgSO_4 + FeO(aq.) = FeSO_4$ and $MgO(aq.)$. These reactions are slightly reversible at temp. lower than boiler temp. The formation of HCl in a less than 10% soln. of $MgCl_2$ is impossible, without the simultaneous formation of H_2SO_4 , the presence of which has not yet been shown.

MARTIN FLENTJE

Experiments in treating wastes from water gas plant. J. R. POLLOCK. *Eng. News-Record* 87, 187(1921).—Gas wastes at Flint, Mich., have been successfully treated with 1500 lbs. CaO per mil. gal., settling for 2 hrs. and then passing the water through 24" coke filters at rate of 10 m. g. d. per acre. The turbidity was reduced 95%, color 90%, O consumed 95% and total solids to 100 p. m. by this process.

F. B.

Handling sugar refinery wastes. PEARSE, GREELEY & HANSEN. *Eng. News-Record* 87, 178(1921).—To prevent pollution of St. Mary's River in Indiana by the Holland-St. Louis Sugar Co., four wastes from the plant are to be handled: (1) Beet-carrying and wash water, 2 mil. gal. per day; (2) diffusion battery and pulp-free water, 0.2 m. g. d.; (3) lime press cake, 37 tons as a solid 50%-moisture cake or 0.15 m. g. d. when diluted with water to make a liquid that will readily flow; and (4) Steffens house wastes, 0.2 m. g. d. The first waste contains beet tails, taps, roots and earth and will be kept sep. from the other wastes and passed through fine screens before discharge into the river. The second waste will be limed and carbonated and reused in the diffusion batteries. The lime press cake will be lagooned for storage until the river affords sufficient diln. for discharge therein. The Steffens house wastes will be evapd., ignited and the potash recovered.

FRANK BACHMANN

Some limitations in the chemical precipitation of trade wastes. FRANK BACHMANN. *Conn. Soc. C. E.* 1921; *Eng. Contr.* 56, 127(1921).—Where wastes contain mineral matter, chem. pptn. is effective. Where org. matter is present, chem. pptn. is not so effective. Available diln. is not always a controlling factor, as growths may result. On silk-mill wastes chem. pptn. with lime, lime and alum, and lime and copper produced a clarification, but did not remove over 50 to 60% of the org. matter.

LANGDON PEARSE

Baltimore waste disposal report. H. G. PERRING. *Public Works* 50, 493-6(1921).

—Experiences with burial, reduction and hog feeding are detailed, with estimates for Baltimore. Sepn. of rubbish, ashes and garbage, incineration of rubbish, dumping of ashes and reduction of garbage are recommended. LANGDON PEARSE

Forty-second semi-annual report of sewerage and water board of New Orleans, Dec. 31, 1920. GEORGE G. EARL. *Public Health Eng. Absts.* Oct. 1, 1921; cf. *C. A.* 15, 406.—Since the decade 1880-89 the malaria death rate per 100,000 has been decreased from 156 to 1, typhoid from 39 during 1890-99 to 7.5, and death rate from all causes from 28.6 per 1000 in 1880-9 to 17.75 in 1920. G. C. BAKER

The Blue River Sewerage problem, Kansas City, Mo. PEARSE, GREELEY & HANSEN. *Eng. News-Record* 87, 439(1921).—An account is given of the unsanitary conditions existing in the Blue River owing to discharge of sewage. It is proposed to construct an interceptor to relieve these conditions. Sewage treatment to the extent of rough clarification with chlorination is recommended. FRANK BACHMANN

The Oklahoma City sewage works problem and report. PEARSE, GREELEY & HANSEN. *Eng. News-Record* 87, 198-9(1921).—Settling tanks and sprinkling filters are recommended. The activated sludge process was considered but high cost of maintenance was not in its favor. FRANK BACHMANN

Sewage disposal studies at Flint, Michigan. J. R. POLLOCK. *Eng. News-Record* 87, 272-3(1921).—The dry weather flow of the Flint River is 55 sec. ft. while flood flow reaches 6,000 sec. ft. The river is in bad condition owing to the discharge of city sewage. The plan is to treat city sewage before 1925. FRANK BACHMANN

Current tendencies in sewage-disposal practice. GEORGE W. FULLER. *J. Western Soc. Eng.* 26, 273-88(1921).—This is a general discussion emphasizing the need for more comprehensive planning of sewage-treatment plants. It refers to state legislation. Sewage treatment is discussed under the following heads: prevailing viewpoints as to objects sought, rational utilization of the natural resource offered by the oxidizing power of water, relation to water supplies, relation to trade wastes, intercepting and outfall sewer capacities, utilization of sewage, sewage irrigation, sewage solids for fertilizer, clarifying arrangements, fine screens, sedimentation tanks, single story tanks in rotation, oxidizing arrangements, trickling filters, activated sludge, treatment and disposal of sewage solids, screenings, sludge drying beds, centrifuging and disposal of sewage solids. G. C. BAKER

Straw filters for sewage purification. ERIC H. RICHARDS AND MICHAEL G. WERKES. *Engineering* 112, 86(1921); *Water & Water Eng.* 23, 297-8(1921).—A soln. of $(\text{NH}_4)_2\text{CO}_3$, 10 parts of N per 100,000, was passed through a percolating filter of wheat straw at a rate of 250 gal. per cu. yd. per day. On the first day 5% of the N passed on to the filter was removed and the amt. increased steadily up to the 20th day when only 1% of the N was found in the effluent. The filter continued to remove N until 7 parts N per 1000 parts of straw had been fixed. The straw was found to contain 86% of the N in the original soln. The effluent was brown in color, non-putrefactive but contained too much carbonaceous matter in soln. to pass the Sewage Commission's test for dissolved O. Passing the straw filter effluent through an ordinary clinker filter gave a satisfactory effluent. The expt. was repeated with sewage from the Harpenden works with the same results. The resulting fertilizer, after storage, was of excellent quality, contained 2.06% N and had no odor. The practical application of this process is limited to sewage works having access to straw in large quantities and where the demand for fertilizer exceeds the supply. M. C. PERRY

The disappearance of pathogenic bacteria from sewage in the course of treatment by the activated sludge process. P. COURMONT, A. ROCHAIX AND F. LAUPIN. *Compt. rend.* 173, 181-4(1921).—Cultures of typhoid, paratyphoid and cholera organisms were inoculated into sewage treated by aeration both in the presence and absence of activated

sludge. At the termination of chem. purification (nitrification) the typhoid-group organisms were still present in the effluent; the cholera organisms were absent. On prolonged aeration all pathogenic organisms disappeared, probably as a result of vital concurrence.

W. F. LANGELIER

Some factors in the purification of sewage by the activated sludge process. GERALD C. BAKER. *Ill. State Water Survey Bull.* No. 16, 182-96(1918-19).—An attempt was made to sterilize both sewage and activated sludge without the colloidal properties of either being changed, in the hope of showing the role played by bacteria in the purification process and that played by physical phenomena. The following sterilizing agents were used: CH_2O , CHCl_3 , phenol, HgCl_2 , heat, and pressure, with aeration before and after treatment and after seeding with definite types of bacteria. Salting out expts., aeration with O_2 , CO_2 and SO_2 , and mechanical agitation were tried. The conclusions are: (1) the purification of sewage by activated sludge is due to oxidation largely carried out by aerobic bacteria; (2) both the sewage and activated sludge contain the bacterial flora necessary for purification; (3) the biological oxidation is attended by absorption of the sewage colloids by the activated sludge; (4) for good clarification the activated sludge must be kept in intimate contact with the sewage, and the sludge itself must be in proper physical condition; (5) the colloids of sewage are, for the greater part, positively charged and may be largely removed by the introduction of negatively charged colloids; (6) the activated sludge process is not comparable to the Miles acid treatment since purification is not dependent upon acidity produced.

G. C. B.

Bacterial reduction in the treatment of sewage by the activated-sludge process. P. COURMONT, A. ROCHAIX AND F. LAUPIN. *Compt. rend.* 172, 1696-8(1921).—Disagreement among various investigators as to the bacterial efficiency of the activated-sludge process led the authors to undertake this lab. study. The sewage was aerated 5-6 hrs., or until the NH_3 had become oxidized. The reduction of total bacteria for 5 trials was 52, 56, 46, 16 and 0%. Counts were made with gelatin media. The max. reduction of colon bacilli was 80%. Most of the trials, however, showed only a slight or negative colon reduction. Prolonged aeration in the absence of activated sludge showed a colon reduction of 95%.

W. F. LANGELIER

Relation of colloid chemistry to tank treatment of sewage. LANGDON PEARSE AND F. W. MOHLMAN. *Am. Water Works Assoc.* 1921; *Eng. Contr.* 56, 134-5(1921); *Public Works* 51, 27(1921).—The methods of detg. colloids are described, together with data on removal by tank treatment. Various investigations are outlined for study.

LANGDON PEARSE

Experiments with Miles acid process of treatment for sewage disposal. W. D. HATFIELD. *Ill. State Water Survey Bull.* No. 16, 247-8(1921).—After treatment, a sedimentation period of 3 hrs. was allowed and when the bottom sludge was thoroughly mixed with the sewage total sedimentation was accomplished. As the sludge built up better clarification was obtained. The grease content of the sludge was maintained but the cost of the SO_2 treatment with a sewage of high alkalinity is prohibitive.

G. C. BAKER

Nine years' operation of the Baltimore sewage works. THEODORE C. SCHAEZLE. *Eng. News-Record* 87, 50-54, 97-101(1921).—The plant comprises bar screens spaced 1" apart, Venturi meters, 3 hydrolytic tanks, 19 sep. sludge-digestion tanks, 28 Imhoff tanks, 7.8 acres sludge-drying beds, 14 cylindrical revolving screens for screening the sedimentation tank effluents and 30 sprinkling filters. The bar screens remove 30 lbs. of dry screenings per mil. gal. Efficiency of the sedimentation tanks shows 61.6% removal of the total suspended solids. Filter rates varied from 2.64 to 3.0 mil. gal. per acre per day, with nitrates of 4.4 to 8.3 p. m. in the effluent and a relative stability

of 78 to 93%. Sep. digestion of sludge has given good results. Bar screenings and sludge are sold to farmers at 25 cents per load. Analytical results showing av. monthly analyses are detailed.

FRANK BACHMANN

Modification of Imhoff tanks. E. A. STEWART. *Munic. & County Eng.* 61, 90(1921).—A plea for exptl. work on the introduction of fresh sewage into the sludge chamber to relieve scum formation.

L. P.

Cleveland sewage-treatment plant. ANON. *Public Works* 51, 177-80(1921).—An engineering description of the construction of the Westerly works comprising coarse screens, grit chamber, Imhoff tanks for a population of 288,000. The Imhoff tanks have a capacity of 0.6 cu. ft. scum and 1.2 cu. ft. sludge per person, giving 8.5 months storage at present and 5.7 mo. ultimately. Cl will be applied to the effluent at the rate of 10 parts per mil.

LANGDON PEARSE

German sewage settling tanks with separate sludge digestion. M. B. TARK. *Eng. News-Record* 87, 369-70(1921).—The Koethen, Neustadt, and Kremer-Kusch tanks are shown in plan and section.

FRANK BACHMANN

Activated sludge. JOHN HAWORTH. *Engineering* 112, 86-7(1921); *Water & Water Eng.* 23, 299-300(1921).—An attempt was made to sep. the 2 functions performed by compressed air: the supply of dissolved O for the maintenance of biological life and the purely mechanical action of agitating the sludge in the liquid. By agitating the sludge in tanks open to the atm., results were obtained similar to those obtained by the use of compressed and diffused air. Dewatering and disposal of the sludge is one of the most difficult and urgent problems to be solved. Expts. in dewatering by pressing or centrifuging have not yet proved satisfactory. H. found that sludges contg. 98-99% moisture are readily reduced to 75% by spreading the sludge on paper-makers gauze and applying a slight vacuum to the under surface. The thin cakes produced in this way can be readily dried in the air. Two exptl. driers constructed on this principle are described.

M. C. PERRY

Activated sludge. F. DIENERT. *Compt. rend.* 173, 184-6(1921).—The sewage of cities may contain antisepsics. The effect of small quantities of phenol on nitrification during activated-sludge treatment is to inhibit NO_2 production. The NH_3 disappears slowly as does the phenol, but as long as the latter is present there is no oxidation to NO_2 . If, however, NO_2 salts are added, NO_3 is formed. The same result was noted when activated MnO_2 was substituted for activated sludge. Activated MnO_2 is prep'd. by mixing 100 g. MnO_2 , 10-20 mg. activated sludge, in 1 l. of water contg. 10 mg. NH_3 and 5 g. clay. After prolonged aeration the MnO_2 sludge becomes activated and is capable of nitrifying 100 mg. of NH_3 per day. Nitrification with activated MnO_2 is quant., whereas nitrification with activated sludge is not. W. F. L.

The purification of sewage with activated sludge. R. CAMBIER. *Compt. rend.* 170, 1417-8(1920).—In a previous article (*C. A.* 14, 2388) the author furnishes data which indicate that the generally accepted theory of bacterial nitrification in the treatment of sewage with activated sludge, may be in error. In the activated-sludge process complete nitrification may occur at 0° , a temp. far below the minimum for bacterial nitrification in pure culture. At 37° (optimum for pure culture nitrification) activated-sludge treatment showed oxidation of NH_3 arrested at the NO_2 stage (cf. preceding abstract) and no improvement in the physical character of the sewage. In the presence of activated sludge the NH_3 disappears within a few minutes of aeration, whereas the NO_3 formation is not apparent until later. However, support for the bacterial theory was shown by the apparent inhibition of nitrification when small amts. of CHCl_3 were introduced with the air. In the present paper the author reports further studies with CHCl_3 showing that 1 part in 18,000 of sewage was sufficient to inhibit nitrification. Since bacteria most sensitive to CHCl_3 are unaffected by much larger

doses it is concluded that the inhibition of nitrification does not necessarily lend support to the bacterial theory. Another expt. in which sewage aerated with chloroformed air and subsequently aerated with pure air to remove all traces of CHCl_3 , showed no nitrification when aerated with new and active sludge. The possibility of direct oxidation with oxygen of the air is suggested. (Cf. following abstract.) W. F. L.

Purification of sewage with activated sludge. R. CAMBIER. *Compt. rend.* 171, 57-60(1920).—The dark color of activated sludge is due to the presence of FeS . Decompr. or alteration of the physical state of the FeS by any cause, as acidity, temp. changes, coagulation, will result in deactivation. Samples of sludge which had become deactivated as indicated by inability to produce NO_3^- , were quickly reactivated by the addition of 45 p. p. m. FeS or the equiv. in solns. of FeSO_4 and NH_4SH . The reactivated sludge produced complete nitrification equiv. to upwards of 20 p. p. m. N. The author suggests that the FeS may act as a catalyst and in support of this cites the fact that a soln. of NaAsO_2 is readily oxidized by a current of air only in the presence of a catalytic agent, e. g., Na_2SO_3 . W. F. LANGEIER

Dewatering sludge. JOHN D. WATSON. *Engineering* 112, 87(1921); *Water & Water Eng.* 23, 300-1(1921).—There are 2 general methods by which sludge may be effectually dewatered: evapn. of the moisture by heat which seems to be economically impractical; and biological decompr. plus air drying. The Birmingham plant provides sedimentation tanks which yield 300,000 tons per year and are freed from sludge once a week; the sludge is removed to tanks for digestion. It has been proved that sludge dries more readily when the digestive process has been carried to completion and this should be done before removing it to the drying beds. Drying varies with the weather, but usually one month to several months are necessary. The dry sludge has been used to eke out the supply of slack. 1 lb. sludge could raise 1 lb. steam and had a calorific value of 4120 B. t. u. A sample dried at 212° F. gave 4893 B. t. u. W. does not claim that the effluent from the sedimentation tank is fit to be discharged into a stream.

M. C. P.

Special problems studied by Illinois Water Survey. *Ill. Water Survey, Bull.* 16, (1918-19); *Eng. Contr.* 56, 268(1921).—There are special reports on fertilizer value of activated sludge; silicic acid, its influence and removal in H_2O purification; factors in activated sludge; a sampler device; prepn. of NH_3 -free H_2O ; preserving mud sample; a typical colonaerogenes forms; chloramine and crenothrix; Miles acid process. L. P.

Irrigation and fertilization with wet activated sludge. C. H. STENTON. *Can. Eng.* 41, No. 8, 10-13(1921); *Public Health Eng. Absts.* Sept. 24, 1921.—S. considers the value of activated sewage sludge as fertilizer both in liquid and dry conditions, and presents data as to crops grown on soil fertilized with activated sludge in comparison with crops grown on soil fertilized with other sewage sludge fertilizers. He holds that the quality of the sludge produced and its value as a fertilizer will probably in the future be considered the all-important feature of the activated-sludge process, and that ordinary drying on suitable sludge filters or shallow lagoons is likely to be more satisfactory and economical than dewatering by sludge presses and centrifuges followed by heat drying, owing to the fact that heat drying lowers the percentage of nitrates in the sludge considerably. He favors the disposal of activated sludge on land in liquid form by means of a system of mains and service pipes radiating from the sewage works during the period Sept. to May, and of air-drying the sludge on lagoon filters during the period June to August and subsequent disposing of the dried sludge.

G. C. BAKER

The fertilizer value of activated sludge. WM. DURRELL HATFIELD. *Ill. State Water Survey Bull.* No. 16, 91-139(1918-19).—Pot and garden expts. showed activated sludge to be superior to dried blood, gluten meal, and other inorg. nitrogenous fertilizers

when applied to lettuce, radishes, sweet corn and cucumbers. Increasing the application of activated sludge on gray silt loam did not prove toxic to the growth of the foliage but decreased the yield of wheat, while more than $\frac{1}{2}$ to $\frac{1}{3}$ ton of dried blood proved toxic. When applied to yellow silt loam activated sludge was the only fertilizer which produced a better yield of wheat than the check plot. Wet sludge gave better results than dried sludge. The N in activated sludge is largely present in the form of nucleoprotein N and its hydrolytic products which are beneficial to plant growth. Uric acid, though at first toxic, is in time nitrified or decomposed so that the N is available, while egg albumin was highly toxic to wheat plants. Acidified activated sludge gave much better results than unacidified sludge probably owing to some hydrolysis during the drying of the sludge. Dewatering of the sludge by filtration and centrifuging after acidification gave promising results.

G. C. BAKER

Intermittent aeration in activated-sludge process. G. A. BURNS. *Can. Eng.; Eng. Contr.* 56, 140-1 (1921).—Data are presented on an exptl. plant to show a recovery after 4-hr. stoppage, in from 6 to 7 hrs., on bacterial removal and free NH_3 , NO_2 and NO_3 , respectively. In albuminoid NH_3 and dissolved O 3 and 2 hrs. were required.

LANGDON PEARSE

Large-scale activated-sludge plant at Woodstock, Ontario. W. G. URE. *Can. Eng.* 41, Aug. 4, 1921.—This plant serves a population of 9000 with flow of 1.5 mil. gal. (Imp.) per 24 hrs. Included are grit chamber, aeration tanks (400,000 gals.) and 3 sedimentation tanks (130,000 gal.) Also in *Eng. Contr.* 56, 363 (1921).

LANGDON PEARSE

New division of sanitation, New York State Dept. of Health. ANON. *Eng. News Record* 87, 313 (1921).—Personnel and outline of activities are detailed. F. B.

Swimming pools at the Univ. of Illinois. MARGARET C. PERRY. *Ill. State Water Survey Bull.* No. 16, 258-64 (1918-19).—Bacteriol. data are given on the swimming pools of both the men's and the women's gymnasiums at the Univ. of Ill. After alum treatment and filtration the water of the men's pool is subjected to the action of ultraviolet rays. Fairly uniform results were obtained. A vacuum cleaner is used to remove the solid matter settling to the bottom. At the rate of $\frac{2}{3}$ p. m. available Cl gave better results on the women's pool.

G. C. BAKER

Correct water for dyeing and textile purposes (SMITH) 25.

Filtering water. J. H. HAERRY. U. S. 1,384,754, July 19. Water is passed horizontally through filtering and O-absorbing material such as coke, sand and gravel while O is permitted to pass into the material at substantially right angles to the direction of flow of the water.

Filter for water supplies. C. A. BROWN. U. S. 1,383,384, July 5.

Regenerating base-exchanging material used for softening water. W. C. FOSTER. U. S. 1,385,124, July 19. In softening H_2O with base-exchanging material, the flow of H_2O to be softened is interrupted and a regenerating material such as NaCl soln. is passed through the base-exchanging material in a direction opposite to that of flow of the H_2O to be softened, followed by washing of the material and repeated treatment with the regenerating soln.

Bacterial and aeration purification of sewage. W. JONES. U. S. reissue 15,140, July 5. See original patent No. 1,247,548, *C. A.* 12, 397.

15—SOILS, FERTILIZERS AND AGRICULTURAL POISONS

J. J. SKINNER AND A. R. MERZ

The Woburn Experimental Station of the Royal Agricultural Society of England.
Field experiments, 1921. J. A. VOELCKER. *J. Royal Agr. Soc. England* **81**, 253-67 (1920).—The annual repts. are made on the continuous growing of wheat and barley under different fertilizer treatments. The highest yield of wheat was obtained on the plot receiving superphosphate, NaNO_3 , $(\text{NH}_4)_2\text{SO}_4$ and lime. $(\text{NH}_4)_2\text{SO}_4$ alone has markedly reduced crop yield, but when used with lime good yields are obtained. Lump lime produced less yield than did ground limestone. Reports are made on the relative values of chalk and lime, and the effect of different forms of lime on grass. J. J. S.

The Woburn Experimental Station of the Royal Agricultural Society of England.
Pot culture experiments. J. A. VOELCKER. *J. Roy. Agr. Soc. England* **81**, 267-77 (1920).—Pot expts. with corn to det. the effect of stannous and stannic oxides, chlorides, and sulfates were made. In general it is shown that the effect of stannic salts is decidedly more marked than that of stannous salts in their influence in either stimulating the crop or producing a toxic effect, and that the chlorides had a more marked effect than the oxides. Sn as a metal appears to have no direct effect upon vegetation. Where differences are shown it is stated to be due to the acid radical and not to the metal. Tin oxide showed no effect in amts. up to 0.10% Sn. Chlorides of Sn have a favorable effect up to 0.1% Sn as SnCl_3 , but with SnCl_2 only up to 0.05% Sn; 0.1% Sn as SnCl_4 was distinctly harmful. SnSO_4 has no effect when used up to 0.1% Sn but $\text{Sn}(\text{SO}_4)_2$ at this concn. is distinctly beneficial. K_2CrO_4 and $\text{K}_2\text{Cr}_2\text{O}_7$ proved very harmful to barley, 0.005% effectually prevented growth. Expts. with wheat in pots with FeSO_4 showed that there was a marked retardation where 0.2% Fe was used. The toxic effect of iron was overcome by lime. Ca silicate in quantities up to 4 tons per acre produced a beneficial effect upon wheat on soil from the stockyard field. Mg silicate and Al silicate had no influence. S in amts. of 100 and 200 lbs. per acre produced only a slight increase with mustard, and a slight decrease with clover and lucerne. Expts. were conducted to det. the relative effects of lime and chalk. Lime produced substantial increases with wheat and barley, while chalk produced practically no increased growth.

J. J. SKINNER

Soil acidity the resultant of chemical phenomena. H. A. NOYES. Mellon Inst. *Science* **53**, 539-40 (1921); cf. *C. A.* **14**, 84.—An "alk." sandy soil became acid in reaction after 3 mos. treatment with CO_2 gas. The acidity of an acid brown silt loam was increased by such treatment. Liming this loam decreased its acidity but not as much as the original "lime requirement" detn. (Veitch) indicated. $1\frac{1}{2}$ times the total lime requirement did not neutralize it. CO_2 increased soil acidity when the soil was limed, limed and phosphated, limed and treated with dried blood and NaNO_3 . The sp. cond. of H_2O exts. showed that CO_2 changed this constitution of the soil, the sp. cond. being increased. Extn. with concd. H_2O lowered the acidity of the soils and this lowering was greater for the CO_2 -treated soils. The sol. material detn. was increased by CO_2 treatments more than could be accounted for in the total C detn., indicating a change of the H_2O of constitution of some of the silicates. The compn. of the concd. H_2O exts. from the different soils varied as the fertilizer constituents added would theoretically replace substances known to be present in the soil. The compn. of the acid H_2O exts. from the CO_2 -treated samples showed that the increased sp. cond. and acidities were associated with substances with low solv. and ionization consts. present under conditions when hydrolysis readily took place. The work leads to the conclusion that soil acidity is the resultant of hydrolytic mass action phenomena and thus the application

of the exact amt. of CaO shown by any method cannot be expected to give exact neutrality.

C. B. DURGIN

Soil acidity and bacterial activity. R. E. STEPHENSON. *Soil Science* 12, 133-44 (1921); cf. *C. A.* 13, 1611.—Applications of cottonseed meal, manure, timothy hay, clover hay, green timothy, and green clover were made at the rate of 10 t. per a. to a light sandy soil and a loam soil in limed and unlimed condition. The materials were placed in 1-gal. earthenware crocks and at intervals of 2, 5, 10, 15 and 22 weeks the NH₃, NO₃, acidity and residual carbonates were detd. The acidity was detd. by the modified Tacke method (cf. Stephenson, *C. A.* 13, 152). The lime requirement of either soil was increased by the org. treatment except where a large amt. of HNO₃ was produced. Ammonification was apparently greater in the absence of lime. Lime stimulated nitrification. The sum of NH₃ and NO₃ was usually greater on the unlimed soil when treated with org. nitrogenous materials. When nitrogenous sources of energy were supplied, nitrification and ammonification were reduced below the untreated soil. Green materials were more readily attacked than the dried materials. The unlimed treatments generally gave a higher non-protein N content than the limed. The sol. unknown non-protein N was little affected by the various org. treatments.

W. J. ROBBINS

Effect of straw on the soil. T. J. MURRAY. Wash. Agr. Expt. Sta., *Bull.* No. 155, 12-13 (1920).—The addition of straw to the soil in amts. of from 0.1 to 0.7% stimulated the formation of nitrates but when added in greater amts. there was a loss of nitrates in every case. Total N detns. showed that although there was a loss in nitrates and a decrease in nitrate formation, there was never any loss in total N. The addition of cellulose to the soil had no inhibiting effect on the nitrifying bacteria.

R. M. J.

The effect of organic matter on soil reaction. II. R. E. STEPHENSON. *Soil Science* 12, 145-63 (1921); cf. *C. A.* 13, 1611.—The application of oat straw at the rate of 10 t. per a. reduced nitrification and ammonification. A mixt. of straw and blood reduced the total N as NH₃ and NO₃ below blood alone. All treatments reduced the lime requirement until nitrification had taken place. Lime-requirement detns. of the limed soils showed them capable of reacting with more lime. Hydrogen-ion detns. showed that the org. treatments generally reduced the true acidity. Changes in soil reaction especially on blood-treated soils followed closely the excess or deficit of NH₃ over NO₃. Highly org. soils and clays exhibit a high degree of buffering while sand shows very little. H₂SO₄ or (NH₄)₂SO₄ increased the hydrogen-ion concn. of the soil but citric acid did not. HNO₃ and H₂SO₄ added in amts. equiv. to the acids which might be produced by complete nitrification of a given amt. of (NH₄)₂SO₄ produced more change in the p_H than did (NH₄)₂SO₄. The max. p_H value with a large excess of lime was p_H = 8.0.

W. J. ROBBINS

The role of osmotic pressure in the toxicity of soluble salts. J. E. CREEAVES AND YEPPEA LUND. *Soil Science* 12, 163-81 (1921).—The osmotic pressure was detd. by cryoscopic and elec. cond. methods on soil to which the chloride, sulfate, carbonate and nitrate of K, Na, Cd, Mg, Fe, and Mn had been added in quantities such that (a) the salts became toxic to the ammonifying organism; (b) the quantity of NH₃ produced per unit time was reduced to $1/4$ normal; (c) the concn. of the salt in the soil was 10×10^{-3} moles per 100 g. of soil; (d) the salt became toxic to the nitrifying organism; (e) the nitric N produced per unit time was $1/4$ normal; (f) there would be 2×10^{-3} moles of the salt per 100 g. soil. With the exception of Mn(NO₃)₂, Fe(NO₃)₂, and Na₂CO₃ there is a close correlation between toxicity and osmotic pressure. All the salts except the 3 mentioned became toxic when the osmotic pressure was less than 3 atm. As the concn. of the salt increased the retarding effect upon the ammonifying organism is not due entirely to the osmotic pressure. All salts tested reduced ammonification to less than $1/2$

normal when the osmotic pressure of the soil reached 15 atm. With the exception of NaCl, Mn(NO₃)₂ and FeCl₃ all the salts tested became toxic to nitrifying organisms when the osmotic pressure ranged between 1 and 2 atm. All the salts reduced nitrification to less than 50% when the osmotic pressure reached 6 atm. W. J. ROBBINS

Field tests on the inoculation of canning peas. R. B. FRED, W. H. WRIGHT AND W. C. FRAZIER. *Soil Science* 11, 479-91(1921).—With a heavy, rich, clay-loam soil, slightly acid, inoculation had no effect. With a rich, silt-loam soil, unlimed and acid, inoculation has caused an increase in the total yield of pea plants, in the yield of peas, and in the % of N. In a neutral soil which had been heavily fertilized for years inoculation produced an increase in yield and in % of N in the plants. W. J. ROBBINS

Aqueous vapor pressure of soils. M. D. THOMAS. *Soil Science* 11, 409-34(1921).—A dynamic method of measuring the aq. vapor-pressure lowerings of soil, accurate to 0.01 mm. of Hg at 25°, is described. The vapor-pressure-moisture curves are rectangular hyperbolae over a wide range of moisture contents, that is, the vapor pressure is proportional to the reciprocal of the moisture content. The position of each curve depends upon the texture of the soil. Na₂CO₃, Na₂SO₄ and NaCl are absorbed by Greenville soil to the extent of 85-90, 70 and 10-41%, resp. Correlations between vapor pressure and the following properties of the soil are given: hygroscopic coeff., wilting coeff., moisture equiv., "solid water," capillary potential, surface tension and curvature of the moisture surface. W. J. ROBBINS

Movement of soluble salts in soils. A. DEMOLON. *J. Agr. prat.* 36, 70-1(1921).—A review of the American and French views. R. B. DEEMER

Fertilizers, the requirements of various crops. A. VIVIEN. *J. fabr. sucre* 62, nos. 30-2(1921).—A general discussion. L. E. GILSON

The effect of fertilizer treatments of Savannah cranberry land. CHARLES S. BECKWITH. *Soil Science* 12, 183-96(1921).—Field expts. on Savannah cranberry land show that the most profitable N fertilizer is NaNO₃ and dried blood. (NH₄)₂SO₄ was unsatisfactory and CaCN₂ of doubtful value. Acid phosphate and rock phosphate were efficient sources of P. K₂SO₄ and HCl were good sources of K. Cranberry lands were found deficient in P; as high as 80 lbs. of actual H₃PO₄ per a. produced large increases in the crop, twenty lbs. of N as NaNO₃ gave excellent returns and a complete fertilizer of 500-800 lbs. per a. gave good results. Over-fertilization causes excessive vine growth and soft berries and induces insect attack. W. J. ROBBINS

Artificial farmyard manure. H. B. HUTCHINSON AND E. H. RICHARDS. *J. Ministry Agr.* 28, 398-411(1921).—The conversion of straw into a condition similar to that of rotted manure can be accomplished by fermentation quite satisfactorily in about 3 months under proper aerobic conditions without special means to maintain a favorable temp. The most favorable conditions are found when the reaction of the mass is neutral or slightly alk. and when some source of available N is supplied. Although the process is accelerated by the addition of a small amt. of sol. N it is retarded by an excess, about 0.7% N being the optimum. The most satisfactory forms of N are (NH₄)₂CO₃, urea and urine while (NH₄)₂SO₄ and cyanamide may be used together with limestone. A large amt. of fresh urine will retard the process at first, hence straw submerged in it will decompose very slowly. This is explained by the excess of sol. N present and by the anaerobic conditions produced. When N in any form is added in excess of the optimum there is considerable loss as the N content of the final product is practically const. regardless of the original compn. M. S. ANDERSON

Carbonic acid as a fertilizer. FRENKEL. *Ann. chim. anal. chim. appl.* 3, 201-5 (1921).—A review. R. B. DEEMER

Transformation of explosives into fertilizers. S. LISSONE. *Industrie chim.* 1, 29-30(1919); *Bull. Agr. Intelligence* 10, 840.—A process is described for recovering the

NH_4NO_3 in unused explosives in a form suitable for use as a fertilizer. This process consists in digesting the explosive with water and then adding powdered peat to the recovered soln. On drying the mixt. a fertilizer is obtained which is called "nitrated peat" and which contains 17.8% water; 18.8% ash; 42.8% NH_4NO_3 ; and 20.6% org. matter.

W. H. Ross

Citrate-soluble phosphoric acid. HEINRICH HACKL. *Chem. Ztg.* **45**, 730-1(1921).—Since Thomas slag meal seldom contains more than 35% of its P_2O_5 in citrate-sol. form it cannot be classed with the citrate-sol. P_2O_5 fertilizer materials, the first group of which (Wolters-phosphate, Palmaer-phosphate and Rhenania-phosphate) is obtained by smelting processes and the second (the dibasic phosphates of Fe and Ca), in the wet way. The dibasic phosphate of CaO (known in the trade as "dicalcium phosphate," "feeding lime" and "precipitate"), whose pre-war use as a feed for bone-softness has been replaced by CaCO_3 , should again be thus used since even if the animal utilizes the CaO only the P_2O_5 reappearing in the feces is not agriculturally lost. It should also be used directly as a fertilizer, especially because the increased consumption of $(\text{NH}_4)_2\text{SO}_4$ with its resultant increased acidity of the soil makes the use of acid superphosphates less desirable. Citrate-sol. P_2O_5 obtained by pptr. in the wet way is more effective than that obtained by smelting processes because of its extremely fine state of subdivision and its behavior towards the H_2O of crystn. in the soil. The detn. of the solv. of the individual forms in H_2O , CO_2 -saturated H_2O and that contains CaCO_3 showed its greater solv. analytically. The samples were shaken a half hr. with 500-cc. portions of solvent with the following results:—

| Solvent | "Precipitate," moist from the press, contg. 26.5% citrate-sol. P_2O_5 and 32% H_2O . | | | | | | Rhenania-phosphate, 9.26% citrate-sol. P_2O_5 . | | | | | | Thomas slag meal, 16.5% citrate-sol. P_2O_5 . | | | | | |
|---|--|------|------|------|---|----|---|-----|-----|--------|-----|-----|---|------|-----|--------|-----|----|
| | I | II | III | IV | V | VI | I | II | III | IV | V | VI | I | II | III | IV | V | VI |
| CO_2 -saturated H_2O | 36.0 | 33.2 | 24.4 | 6.4 | — | — | 9.4 | 9.8 | 9.8 | 5.6 | 6.1 | 3.7 | 13.1 | 12.2 | 7.4 | 9.1 | 4.9 | — |
| | (Sum of exts. 100% of total P_2O_5) | | | | | | (Sum of exts. 44.4% of total P_2O_5) | | | | | | (Sum of exts. 46.7% of total P_2O_5) | | | | | |
| Rain H_2O | 9.3 | 11.0 | 9.5 | 16.2 | | | Traces | | | Traces | | | Traces | | | Traces | | |
| | (Only 4 exts. made) | | | | | | | | | | | | | | | | | |
| CaO -contg. hard tap H_2O | 8.1 | 6.2 | 4.7 | 5.6 | | | Traces | | | Traces | | | Traces | | | Traces | | |
| | (Only 4 exts. made) | | | | | | | | | | | | | | | | | |

The value of the use of an aq. CO_2 soln. for the sub-grouping of the citric acid and citrate-sol. phosphates lies in the fact that CO_2 plays an important role in the soil with respect to the action of fertilizers.

ALBERT R. MERZ

Lime-phosphoric acid experiments. G. L. SCHUSTER. Delaware Agr. Expt. Sta., *Bull.* **126**, 11-12(1920).—By means of plot experimentation the results obtained indicate that there is little difference in the different forms of lime. Acid phosphate was more effective than other sources of P_2O_5 . The effectiveness was in the following order: acid phosphate, basic slag, bone meal, raw rock phosphate. J. J. SKINNER

Effect on the growth of potatoes, corn and beans resulting from the addition of borax to the fertilizer used. J. R. NELLER. *Soil Science* **12**, 79-131(1921).—Pot expts. were performed to det. whether injuries previously observed in the field and greenhouse were due alone to the borax present in the fertilizers applied and, if so, what the max. amt. of borax is which can be applied per a. without causing this injury. Plants were uninjured where fertilizer mixts. made from borax-free chemicals were applied to soil in pots in which potatoes, corn or beans were grown. Anhydrous borax at the rate of 3 lbs. per a. was the largest amt. that could be applied in drills with safety to beans, for corn somewhat under 5 lbs. and for potatoes somewhat above 5 lbs. per a. Borax applied below the seed piece was more toxic than when applied above. Mixing the borax with fertilizer decreased the injury. Lime reduced the toxicity of the borax.

Gypsum or fertilizer reduced the toxicity of borax for corn but had no influence in the case of beans or potatoes. More injury was obtained in soils of low-water content than in soil with high-water content. The injury by a commercial fertilizer carrying borax was of the same type as that by equiv. amt. of borax mixed with fertilizer salts. W. J. R.

Use of natural phosphates in rice fields in Indo-China. BUSSY. *Bull. agr. inst. sci. Saigon* 1, 265-6; *Bull. Agr. Intelligence* 11, 19-20.—The rice fields of Cochin-China are of two classes: (1) soils of the rich alluvial plains of the west contg. 10% org. matter and fairly rich in K; (2) soils occupying the slopes of the valleys of the eastern region. They are of a sandy clay nature poor in all fertilizing elements and lacking humus. Natural phosphate associated with CaCO_3 , applied to soils of the first type, possesses 2 distinct actions. The first is the action of CaCO_3 which promotes nitrification rendering the N in the org. matter assimilable, the second, that of phosphate of lime which enters into soln. owing to the carbonic acid dissolved in the soil. The P_2O_5 then combines in an insol. state with the Fe and Al in the soil and is attacked by the alk. carbonates. The action of CaCO_3 on soils of the second type would have a harmful effect in provoking too active nitrification tending to diminish the slight reserve of N. The $\text{Ca}_3(\text{PO}_4)_2$ in the rich rice land will be subject to the action of the carbonic acid and phosphates of Fe and Al will be formed. The reaction stops there for the nitrogenous org. matter is lacking and cannot produce carbonates of ammonia. B. recommends the following economic formula for soils of this type: Mix 1000 kg. peat and 20 kg. of natural phosphate and expose to the air for one year, turning over from time to time. Five to 10 kg. of K_2SO_4 would increase the soly. of the P. This compost should be used in quantities of 15 to 30 tons per hectare.

R. M. JONES

Local experiments with fertilizers for cereals and root crops, performed in Fyn in the years 1901-15. KARSTEN IVERSEN. *Tid. Landbrug. Planteavl* 26, 193-297 (1919).—Expts. were made to det. the fertilizer needs of the soils in each locality and the effects of fertilizers on various crops. NaNO_3 , $\text{CaH}_4(\text{PO}_4)_2$, and K have a greater effect on the crops when used 3 together than when used singly or in pairs. The needs of the crop for fertilizer depend largely on the chem. compn. of the crop. The assimilation of the fertilizer and the effect of climatic conditions on the utilization of artificial fertilizers are discussed.

RUSSELL, M. JONES

The relation of organic matter and the feeding power of plants to the utilization of rock phosphate. F. C. BAUER. *Soil Science* 12, 21-41 (1921).—Expts., in which org. matter and rock phosphate were mixed and provision was made by leaching or upward-moving capillary H_2O to carry off the sol. P, failed to show a solvent effect of the decaying org. matter on the rock phosphate. In some cases mixts. of org. matter and rock phosphate applied to pot cultures increased the growth of corn over either alone. The decaying org. matter either had a solvent action on the rock phosphate or else the P supplied by the org. matter gave the seedlings a better start so that they were able to exert a stronger feeding power toward the rock phosphate. The growth of 15 different kinds of plants on rock phosphate in sand cultures showed a wide variation in the dry matter produced. There was no definite relation between the amt. of plant growth and the extent of root systems, P content, or the acidity of the plant juices. Sweet clover possesses remarkable feeding power toward rock phosphate and feldspar and is well suited to rotation for the utilization of these.

W. J. ROBBINS

Cyanamide in France. ANON. *Bull. Assoc. Italo-France d'Expansion Economique* 2, No. 8, 14-20 (1919); *Bull. Agr. Intelligence* 10, 1085-8.—A statistical discussion of the cyanamide industry in France in which it is shown that the total output of the new factories that were built at the instigation of the Munitions Ministry could be consumed in the fertilizer industry if the consumption (per acre) of N in France approached that used in Belgium or Germany.

W. H. ROSS

The utilization of the energy of waterfalls for the manufacture of nitrogenous fertilizers. PAUL LEVY-SALVADOR AND E. F. COTE. *Ann. sci. agron.* 36, 220-1; *Bull. Agr. Intelligence* 10, 1085.—A review and discussion of this problem as applied to economic conditions in France.

W. H. Ross

The influence of certain fertilizer salts on the growth and nitrogen content of some legumes. ALEXANDER MACTAGGART. *Soil Science* 11, 435-55(1921).—Alfalfa, Canada field peas, or soy beans were grown in the greenhouse in wooden boxes holding 128 lbs. of soil, mostly sand, low in plant nutrients. N as dried blood, Na_2HPO_4 , KCl, CaSO_4 or mixts. of these, both limed and unlimed, were applied to the soil. At the end of growth the plants were dried and the total N was detd. The NO_3 content of the soil also was detd. 3 weeks after harvest. P alone had the most marked effect, increasing the dry matter and total N decidedly and to a less extent the % of N. N as a single element did not benefit the plants with respect to yield, N or % of N. Combined N in the amt. used did not hamper N assimilation. K, used alone, increased the total N and dry matter of Canada field peas and alfalfa but not of soy beans. It increased the % of N in all three crops. S alone increased the growth and N content of alfalfa but had no effect on the peas or soy beans. Where P was applied there was the greatest NO_3 accumulation after all crops. N alone increased the NO_3 accumulation after all three crops, but with other elements it had no effect. K slightly inhibited it. S increased nitrification in soil which had grown alfalfa but did not in the case of peas and soy beans. In general there appears to be a correlation between dry matter produced and soil nitrification. This probably is due to the greater root system which decays.

W. J. ROBBINS

The acid amide fraction of nitrogen of peat. I. E. J. MILLER AND C. S. ROBINSON. *Soil Science* 11, 457-67(1921).—Attempts to sep. glutaminic acid directly from the hydrolyzate of peat by treating it with dry HCl gas at 0° and allowing it to stand in the refrigerator failed. The application of Foreman's method resulted in the sepn. of both glutaminic and aspartic acids and indicated the presence of pyrrolidonecarboxylic acid in this material.

W. J. ROBBINS

The fixation of atmospheric nitrogen by inoculated soy beans. E. B. FRED. *Soil Science* 11, 469-77(1921).—Ito San soy beans inoculated and uninoculated were grown in the field on Plainfield sand. Inoculation increased the yield 1787 lbs. per acre or more than three times and resulted in a net gain of 57 lbs. of N per acre. Approx. 87% of the total increase of N was in the soy-bean tops. Inoculation increased the % of N in tops and roots. Although the soy-bean tops were removed, inoculation favored the growth of rye the following year.

W. J. ROBBINS

Nitrogen losses under intensive cropping. J. G. LIPMAN AND A. W. BLAIR. *Soil Science* 12, 1-19(1921).—A study had been made of N losses from a loam soil in cylinders with natural drainage which have been under a five-year rotation of corn, oats (2 yrs.), wheat and timothy for 20 yrs. Different forms of N are used alone and with farm manure. A complete record of the amt. of N applied in the fertilizers and that removed by the crops has been kept. Also N detns. have been made on the original soil and on samples collected in 1907, 1912 and 1918. During the first 10 yrs. the loss of N amounted to 103 lbs. per acre annually. During the 3rd 5-yr. period it was the same. During the 4th 5-yr. period there was a gain in some cylinders, largely due to the growth of legume crops. Carbon detns. made in 1918 show gains in C content for nearly all those cylinders that received both farm manure and commercial fertilizers. W. J. R.

Insecticide investigations. A. L. LOVETT. Oregon Agr. Expt. Sta., *Bull.* 169, 1-55(1920).—The acid arsenate of Pb is assimilated to a greater degree than the basic arsenate and has, therefore, a higher killing efficiency than the latter salt. It requires approx. 0.1595 mg. of As_2O_3 to kill 1,000 small tent caterpillars, and approx. 1.84 mg.

to kill 1,000 nearly mature caterpillars. A diln. of 1: 400 of $PbHAsO_4$ proved a satisfactory killing dosage for small caterpillars. The powdered Pb arsenates are physically superior to the paste forms and are generally the advizable form to use. The adhesive-ness and the wetting and covering power of sprays may be increased by the use of spreaders, the most important of which, in the order of their merit, are, caseinate, glue, gelatine soap bark and oil emulsion. The Ca arsenates have a high killing efficiency as a poison spray for chewing insects, but they are not as stable as the corresponding Pb salts, and their methods of manufacture have not been so thoroughly standardized. For use in com. orchard spraying under Western Oregon conditions it is advizable to have an excess of lime present in the Ca arsenate solns. Nicotine sulfate is a powerful repellant for tent caterpillars and an effective ovicide for codling-moth eggs.

W. H. ROSS

Experiments with hot water in the treatment of balled earth about the roots of plants for the control of Japanese beetle larvae. B. R. LEACH. *Soil Science* 12, 63-8 (1921).—The use of hot water because of slowness and injury to the trees cannot be used to control the grubs of the Japanese beetle. W. J. ROBBINS

Experiments in the treatment of balled earth about the roots of coniferous plants for the control of Japanese beetle larvae. B. R. LEACH AND J. W. THOMAS. *Soil Science* 12, 43-61 (1921).—Studies of the toxicity of sodium thiocarbonate, sodium ethyl xanthate, $NaCN$, $CuSO_4$, KF , camphor, CS_2 , thymol, mustard oil and $CHCl_3$, on naked *Popillia* grubs, on the grubs imbedded in soil and on coniferous trees whose roots were imbedded in soil are reported. Sodium thiocarbonate and sodium ethyl xanthate in relatively concd. soln. killed the grubs in the soil about coniferous tree roots but also injured the plants. W. J. ROBBINS

The control of the strawberry leaf beetle. E. N. CORY AND W. C. TRAVERS. Maryland Agr. Expt. Sta., *Bull.* 236, 133-6 (1920).—An application of a mixt. of 15% Pb arsenate powder and 85% dusting S will control depredations of the beetle. W. H. R.

The combating of vermin chemically. HANS HELLER. *Z. angew. Chem.* 33, Aufsatzteil, 157 (1920).—Details are given of a fatality resulting from the use of HCN in destroying moths. The substitution of chloropicrin for HCN as proposed by H. (*Naturwissensch. Wochenschr. N. F.* 18, 425 (1919)) is advocated for most cases in which it is used. ALBERT R. MERZ

Ammonium sulfate salt peter (ULEX) 7. Irrigation and fertilization with wet activated sludge (SHENTON) 14. Effect of ammonium sulfate upon plants in nutrient solutions supplied with ferric phosphate and ferrous sulfate as sources of iron (JONES, SHIVE) 11D. Lignin and humin substances (JONAS) 11D. The production of acid phosphate at Trenton, Ont. (ANON) 18. Straw filters for sewage purification (RICHARDS, WEEKES) 14. Fertilizer value of activated sludge (HATFIELD) 14. Acid and alkaline decomposition of potassium cyanide (HARKER) 6.

Plant stimulant and fertilizer. J. R. CAMPBELL. U. S. 1,384,990, July 19. A plant stimulant and fertilizer is prep'd. by mixing calcite with 25% its wt. of a ppt. containing Fe compds. produced by neutralizing mine water with $CaCO_3$ (which may simply be added in excess to the mine water).

Apparatus for the manufacture of acid phosphate. R. T. GASTON. U. S. 1,385,126. July 19. The app. comprises a stationary circular den with a revoluble cover carrying a conveying pipe for supply of material to the den and also provided with an elevating app. for the removal of material from the den.

Apparatus for manufacture of acid phosphate or superphosphate. W. T. DOYLE. U. S. 1,383,911, July 5.

Acid phosphate or superphosphate. W. T. DOYLE. U. S. 1,383,912, July 5. A mixt. of ground phosphate rock and H_2SO_4 is stored for a time, pulverized and then mixed with additional phosphate rock to take up the free H_2SO_4 and H_3PO_4 . Steam and fumes are withdrawn.

Fungicide. F. C. COOK. U. S. 1,384,304, July 12. Solns. of $Ba(OH)_2$ and $CuSO_4$ are mixed to form a spray for use on fruit, foliage, etc.

16—THE FERMENTATION INDUSTRIES

H. S. PAINE

Alcoholic fermentation as a source of glycerol. K. SCHWEIZER. Winterthur, Switzerland. *Chimie & industrie* 6, 149-59(1921).—A general review of our present knowledge of the mechanism of alc. fermentation, of the methods for increasing the yield of glycerol as much as possible, and of the extn. and purification of the latter. A considerable bibliography (104 references) is given. A. P.-C.

Sorghum as a possible source of industrial alcohol. A. A. RAMSAY. *Agr. Gaz. N. S. Wales* 31, 479-84(1920).—Early amber cane, *Sorghum saccharatum*, Planter's Friend and Saccaline were the varieties examined. Single and double crushes were made. The yield of sorghum ranged from 5.5 to 17.6 tons per acre. The "tops" or heads varied from 8.9 to 26.8 % of the total wt., the leaves, from 10.7 to 20.7%, and the clean stalks from 60.7 to 80.4 %. The yield of juice by single crush varied from 20 to 36% from the clean stalks. The sucrose content ranged from 4.7 to 14.8%; the fruit sugar content, from 2.1 to 4.5%. The yield of 95% EtOH ranged from 6.8 to 113 gal. per acre; or in terms of 1 ton of clean canes, from 2.03 to 7.99 gal. The total yield of juice from double crushing gave a somewhat larger yield, but not the anticipated one of 65 to 75%. Judging from the figures reported the production of alc. from sorghum would not be profitable. Complete analytical data are presented in tabular form.

R. B. DEEMER

The manufacture of alcohol from brown sugar and a method of preparing the yeast. LUIS BUHOT. *Bol. ind. com. trabajo Mexico* 4, 141-2(1920).—A general discussion of modern fermentation practice. For prep. pure yeast cultures the following culture medium is recommended: Molasses soln., sp. gr. 1.07, 1000 g., maltopeptone 1 g., NH_4 phosphate 0.4 g., K phosphate 0.4 g., $MgSO_4$ 0.2 g., H_2SO_4 1 g. L. E. GILSON

Increasing the yield of alcohol in the fermentation of crude sugar or maize. LUIS BUHOT. *Bol. ind. com. trabajo Mexico* 4, 97-8(1920).—A discussion of the advantages of using pure cultures of selected varieties of yeast. L. E. GILSON

New classes of stimulators of alcoholic sugar splitting. VII. Chemically defined fermentation catalysts. CARL NEUBERG, ELSA REINFURTH AND MARTA SANDBERG. Kaiser Wilhelm Inst. exper. Therap. in Berlin-Dahlem. *Biochem. Z.* 121, 215-34(1921).—These expts. demonstrate that adenine, hypoxanthine, xanthine, guanine, heteroxanthine, 8-methylxanthine, 1,7-dimethylxanthine, theobromine, theophylline, caffeine, tetramethylxanthine, trichlorotetramethylxanthine, tetrachlorotetramethylxanthine, adenosine and guanosine stimulate alc. fermentation of sugar. Yeast nucleic acid, spleen nucleic acid, sperm nucleic acid, thymus nucleic acid and inosinic acid do not exert so appreciable a stimulating influence. On the other hand certain purine decompn. products such as alloxanthine, mesoxalic acid and allantoin are active. Even uric acid and its salts are effective. This general activity may or may not be related to the reducing power of these compds. F. S. HAMMETT

Studies in the fermentation of cellulose. GILBERT J. FOWLER AND GANESH VAMAN JOSHI. *J. Indian Inst. Sci.* 3, Part IV, 39-60(1920).—The scarcity of coal on the

western coast of India, where cellulose materials are abundant, suggested the possibility of utilizing for fuel the gases obtained from the fermentation of cellulose. The work of Omelianski on the anaerobic fermentation of cellulose (*Compt. rend.* 1895, 121-653; 1897, 125-1131; *Chem. Zentr.* 1900, I, 918) forms the basis of the studies. Hemicelluloses proved most suitable, lignocelluloses less, and normal celluloses least suitable for fermentation. Schweitzer's reagent can be used for detg. the suitability of any raw material for cellulose fermentation. The raw materials used in the expts. included filter paper (representing normal celluloses), newspaper (representing lignocelluloses), and banana stems and skins (hemicellulose). The inoculating material consisted of a bacterial emulsion prep'd. from a sludge taken from the bottom of a septic tank. The rate of fermentation can be increased to a slight extent by the addition of phosphates, while acetates are harmful, especially acetate of Pb. The organisms are especially sensitive to Zn. The fermentation is most active in a medium 0.1% alk. The best results were obtained when the ratio of the cellulose material to inoculant was 0.1/1. The fineness of division of the cellulose has a great effect upon the rate of fermentation; the best results are obtained from the use of a pulp. The optimum temp. is 30°. The rate of fermentation can be accelerated to 3 times that of normal by removing the products of fermentation as rapidly as they are formed. The analyses of the gases formed in the fermentation of cellulose are 81% CH_4 and 14.5% H from the filter paper, and 87% CH_4 and 5.4% H from banana stems. The sol. products of fermentation consisted chiefly of AcOH , which was detd. by Duclaux's method (*Traité de microbiologie*, 1900, II, 385). The av. calorific value of the gases formed in the fermentation of cellulose was 516.8 per cu. ft. The authors conclude that the fermentation of cellulose might prove a useful process for the production of fuel gas for industrial purposes where coal is not available.

W. L. OWEN

The treatment of maize and rice (in brewing). W. WINDISCH. *Wochschr. Brauerei* 38, 33-7, 39-41 (1921); *Chimie & industrie* 6, 220 (1921); cf. *C. A.* 15, 2690.—Degerminated maize should contain less than 1% fat. With rice the only important factor is the moisture. Details of working the raw grains are given.

A. P.-C.

Practical notes on the treatment of rice and maize in brewing. W. COBLITZ. *Wochschr. Brauerei* 38, 29-30 (1921); *Chimie & industrie* 6, 220 (1921).—The raw grain can advantageously be worked by the old Bavarian method. Rice can be treated mixed with the malt in the same way as pure malt; but difficulties are likely to crop up on drawing off. With maize a different procedure must be followed. Details of the treatment are given.

A. P.-C.

Malted barley and hordenine. A. GARRIGUES. *Bull. thérapeutique* (May, 1921); *Industrie chimique* 8, 329 (1921).—A monograph on hordenine from a chem., biological, therapeutic, and pharmacological point of view.

A. P.-C.

Wines from Alsace-Lorraine. (Vintage of 1919.) G. FILAUMEAU AND L. RIEDER. *Ann. fols.* 13, 136-46 (1920).—Analyses are given and comments are made on 24 wines from the Department of Haut-Rhin, 10 from Bas-Rhin, and 6 from Moselle, all from the 1919 vintage.

A. P.-C.

Wine from grapes attacked by insects (eudémisées). E. HUGUES. *Ann. fols.* 14, 139-41 (1921).—In order to det., if possible, the nature of the action of certain insects on grapes, two lots were picked from the same vines, one of practically sound grapes and the other grapes which had been considerably damaged. They were pressed immediately after picking, and the musts on analysis gave the following results for the sound and damaged grapes, resp.: reducing sugars (as g. of glucose per l.) 175, 225; total acidity (as g. H_2SO_4 per l.) 5.48, 11.10; volatile acids (g. H_2SO_4 per l.) 0.10, 0.35; alc. by vol. none, 0.3%; color colorless, decidedly red. The sound grapes yielded 712.5 cc. of wine and 125 g. of pulp per kg., and the damaged grapes 647.5 cc. and 215 g., resp. It may

be assumed that at the time when the grapes are attacked by the insects the tissues are already built and are subsequently modified only by increase in the sugar content and decrease in acidity; so that the amt. of pulp may be taken as a measure of what would have been the wt. of the grapes if they had not been attacked. On this assumption the 215 g. of pulp from the damaged grapes would correspond to about 1.72 kg. of sound grapes; this shows a loss of about 42% due to the action of the insects. The wines obtained from these musts were also analyzed. That from the sound grapes had a normal compn.; while that from the damaged grapes showed high alc., excess of acidity, very high ext., and a peculiar bitter taste, also a distinct + polarimetric reading, probably due to the presence of dextrins. The characteristics of the wine from the damaged grapes are extreme, as it was prep'd. entirely from grapes which had been considerably damaged; but in bad years com. wines may be found which approach it more or less.

A. P.-C.

Natalite, motor fuel (ANON) 21. Motor fuel from vegetation (BOYD) 21. Role of the chemist in relation to the future supply of liquid fuel (HIBBERT) 21.

Preparation of lactic acid, succinic acid and glycerol. TOMOTSUNE TAIKA AND TAIWAN HATSUMEI KYOKWAI. Japan 36,834, July 28, 1920. Unhulled rice is fermented by fungi, such as *Mucor rouxii* Wehmer, *Rhizopus formosensis* Nakazawa, etc. When the reaction has been completed, alc. is distd. away and the residue is treated with lime or alkali carbonate, from which 1-2% lactic acid, 0.1% succinic acid and 1.5% glycerol are obtained.

17—PHARMACEUTICAL CHEMISTRY

W. O. EMERY

The quantitative determination of citronellol by means of the formylation method. ALEXANDER St. PFAU. *J. prakt. Chem.* 102, 276-82 (1921).—In the detn. of citronellol (A) (*Ber.* 33, 2307 (1900)) in mixts. of geraniol and A by its reaction with HCO_2H (B), high results have been reported by several observers (*Ber. Schimmel & Co.* Oct. 1913, 60; *Perfum. Record* 5, 51 (1914)). By treatment with 100% or 85% B, 3 products (in approx. equal yields with 100% B) were obtained: (1) citronellol formate (C); (2) *citronellolglycol formate* (D), mobile liquid with faint odor, b.p. 129°, decomp. when heated in the air, sol. in 60% EtOH and in 3.5 vols. of 50% EtOH; (3) *citronellolglycol diformate* (E), mobile liquid with a faint odor, b.p. 140-1°, decomp. when heated in the air and sapond. by standing in the air. There was obtained also with 85% B a very small yield of an unidentified high boiling liquid (F), probably a terpene. By boiling gently 1 hr. 1 part of A with 2 parts of B, washing with H_2O and Et_2O , evapg. the Et_2O *in vacuo*, there were obtained the following yields for 100% and 85% B, resp. C 20%, 30%; D 35%, 40%; E 29%, 12%; F and unchanged A 1%, 3%; polymerized residue 15%, 15%. E could not be easily sapond., and after 2 hrs. shaking with 40 vols. of H_2O it was unchanged. It was the formation and properties of E which explain the high results obtained by previous observers. C. C. DAVIS

The combination of soft soap with chrysophanic and salicylic acids in pomades. R. HUERRE. *Répert. pharm.* 33, 193-6 (1921).—H. has investigated the various combinations of soft soap with chrysophanic and salicylic acids used in the treatment of psoriasis to det. what becomes of the acids. In the combinations examd. chrysophanic acid was found to be present largely in the free state, only a small amt. being combined with K. The amt. combined was in direct proportion to the free KOH present in the soap. It is too weak an acid to replace either the CO_2 in K_2CO_3 or the org. acids of the

soap. Salicylic acid on the other hand was never present in the free state, but always as K salicylate. It not only liberates CO_2 from K_2CO_3 , but replaces the org. acids (oleic, palmitic and stearic) in the soap as well. The fallacy of using the present combinations of these substances to obtain the therapeutic action of free salicylic acid is, therefore, quite evident.

A. G. DUMEZ

Santoveronin. BODINUS. *Pharm. Ztg.* 66, 632-3 (1921).—An alleged anthelmintic consisting of a Cu salt (CuSO_4) apparently in ester-like combination with an aromatic alcohol.

W. O. E.

Santoveronin. A. MARX. *Pharm. Ztg.* 66, 685 (1921).—A reply to Bodinus' article (cf. preceding abstract) contg. the information that this product consists essentially of "naphthalinphenolate" in combination with a metallic salt, sometimes with an Al salt, preferably with a CuO compd.

W. O. E.

Determination of the specific gravity of cera alba and cera flava. WOLFSCHLAG. *Pharm. Ztg.* 66, 663 (1921).—The method involves the use of a pycnometer.

W. O. E.

True oil of cade. C. PEPIN. *Ungerer's Bull.* 2, No. 4, 6-8 (1921).—Two processes, both of undoubted antiquity, are in use for obtaining oil of cade; distn. per descensum and combustion in a confined space. The investigation carried out with the product obtained by the former treatment involved in the main a study of solv. in 96% alc., density, acidity in terms of AcOH , tests for furfural and pyrocatechol, reaction with $\text{Cu}(\text{AcO})_2$, and distn. under atm. and reduced pressure. As a result of the investigation, the following description of true oil of cade may be formulated. A liquid tar, reddish brown by transmitted light, limpid, clear, uniform and without sediment, with a decidedly smokey odor; completely sol. in 96% alc., and more than 70% should distil over at 300° . It should give no green color with $\text{Cu}(\text{AcO})_2$.

W. O. E.

American sweet gum or styrax. R. E. SPOKES. *Ungerer's Bull.* 2, No. 4, 12-3 (1921).—Am. styrax is commonly referred to as sweet gum, gum wax, liquid-amber or copalm balm. Examn. of 3 strained samples yielded the following values in %: incineration residue 1.4, 1.4, 1.4; acid value 35, 39, 37; undissolved residue 3.0, 3.5, 3.6; cinnamic acid (free) 12.07, 13.84, 13.75; resin esters 34.1, 35.5, —; styrol 1.1, 1.6, —.

W. O. E.

A consideration of arsphenamine and certain other organic arsenic compounds used in the treatment of syphilis. GEO. B. ROTH. *Pub. Health Repts.* 36, 1990-2005 (1921).—R. reviews the development and chemistry of the org. As compds., describes the official methods of testing, and records his observations on the toxicity as affected by the nature of the compd., the form in which the soln. is prep'd. the concn. of soln., the rate of injection and the effect of changes in a soln. over a period of $1/2$ hr. Neoarsphenamine is not merely a sol. form of arsphenamine but is radically different in its action. The di-sodium salt of arsphenamine is less toxic than the mono-sodium salt. A soln. reaches its minimum toxicity about 20 min. after being prep'd. if not disturbed but vigorous shaking causes sufficient oxidation greatly to increase its toxicity. Neoarsphenamine is relatively less stable in the ampoules, becoming less sol. and more toxic. The test requires that a 100-150-g. white rat must tolerate 100 mg. of arsphenamine 48 hrs. when given intravenously in 2% alk. soln. For neoarsphenamine, 200 mg. must be tolerated for 7 days intravenously injected in 4% soln. Attention is called to the importance of distinguishing between the toxicity due to improper solution or its administration and that due to the drug itself.

H. C. HAMILTON

Iodine splitting from iodoform and its substitution products. G. BACHEM AND H. KREINS. Univ. Bonn. *Biochem. Z.* 120, 230-49 (1921).—A series of crude semi-quant. detns. of the amt. of I split off from various I preps. used as antiseptics, such as CHI_3 , novioiodin, Euphenol, etc., under the influence of light, H_2O soln., protein solns. and ascitic fluid. A wide variability was observed.

F. S. HAMMETT

Existence of a purgative complex in laxative drugs. FELIX DAELS. *Bull. acad.*

roy. méd. Belg. [5] 1, 185-94 (1921).—72 g. of Knopf's product (A) (Ger. pat. 175,862) were obtained from 1 kg. cascara powder. Hydrolyzed in CHCl_3 with 25% H_2SO_4 it yielded dextrose. The CHCl_3 was evapd. dry, the residue dissolved in aq. NH_3 , and acidified with HOAc until no more emodin pptd. The filtrate was evapd., leaving a small amt. of a product sparingly sol. in aq. NH_3 , which was recrystd. from CHCl_3 and appeared to be an *isoemodin*, reddish crystals, m. 212°, sol. in 10% Na_2CO_3 with a red color. A contains 54% of glucosides of the anthraquinone series, 23.3% of tannin, 12.5% ash contg. CaHPO_4 , and 3.5% protein. While no direct evidence was obtained, it is believed that an enzyme is present which splits the glucosides in the intestine, active substances being produced. Mixed with emulsin A was far more active than without. Also, when macerated with KNO_3 soln. and incubated 96 hrs. at 37° sugar was found in the filtrate, indicating the presence of an enzyme in the cells. Rheopurgarine is also split when incubated with emulsin. A is not a K salt as believed by Knopf. Contrary to others, cascara sagrada does not contain chrysophanic acid. It is believed that the 3 components of the "purgative complex" are anthraquinone glucosides, an hydrolytic enzyme comparable to emulsin, and an activating mineral substance. Diminished action results from the absence, or presence in too small amts., of any of these.

M. HEIDELBERGER

Arsenobenzenes: galyl, its formula and composition. F. DE MYTENABRE. *Bull. acad. roy. méd. Belg.* [5] 1, 249-56 (1921).—The "galyl" (A) prep'd. by M. Naline does not correspond to the chem. formula usually given for A, is not of const., compn., and is very easily alterable. One sample contained, in addition to the glucose stated on the label, 3% NaCl , 12% Na_2CO_3 , and 18% Na_2SO_4 . Instead of being neutral, as claimed, it was alk. to both phenolphthalein and litmus. The toxicity of A is of about the same order as that of the other arsenobenzenes investigated by de M. (*C. A.* 15, 144). Also in *J. pharm Belg.* 3, 653-5 (1921).

M. HEIDELBERGER

Mercury saligenin, a new antiseptic. A. D. HIRSCHFELDER, M. C. HART AND F. J. KUCERA. Univ. Minnesota. *Proc. Soc. Exptl. Biol. Med.* 18, 77-9 (1920).—Saligenin, horosaligenin, *p*-hydroxy-*m*-nitrophenylcarbinol, *p*-hydroxy-*m*-aminophenylcarbinol and piperonyl alc. have been found to be weak antiseptics. Hg saligenin has the same antiseptic power as HgCl_2 and is much less irritant to mucous membranes. An acetate of this compd. and the Na salt have the same antiseptic strength. V. C. M.

Further researches on formaldehyde sulfurous acid ("sulfiformine"). PHILIPPE MALVEZIN. *Industrie chimique* 8, 311-4 (1921); *Bull. assoc. chim. sucre* 38, 210-20.—Attempts made to prep. pure formaldehyde sulfurous acid by the interaction of dry SO_2 and CH_2O vapors (obtained by treating 40% formalin with baryta) were unsuccessful, probably because the presence of a fairly large amt. of H_2O is required for the reaction. A product sufficiently concd. for industrial, pharmaceutical, and medicinal purposes is obtained by means of the following patented app.: a SO_2 generator (e.g., a SO_2 cylinder with reducing valve), a distg. app. with a rectifying column for the production of CH_2O vapors as rich as possible, but not H_2O -free, a reaction column somewhat similar to a van't Hoff atomizer at the top of which are fed the SO_2 and CH_2O vapors, a condenser for cooling the vapors of formaldehyde sulfurous acid, and a receiver. The SO_2 and CH_2O should be fed as slowly as possible to the top of the reaction column, keeping always a slight excess of SO_2 . Under these conditions there is always formed at the beginning a certain amt. of a light ethereal liquid, which can be decreased (and even completely eliminated) by carefully regulating the current of SO_2 . A sample prep'd. in this app. gave the following results: d. 1.255, free SO_4 node, combined SO_2 199.5 g. per l., acidity (as H_2SO_4) 220 g. per l. By adding increasing amts. of a SO_4 soln. of known concn. to a given amt. of CH_2O soln. of known strength, and titrating the excess of SO_2 in the mixt., it was detd. that they combine in equimol.

proportions, so that formaldehyde sulfurous acid must have the formula $\text{HOCH}_2\text{SO}_3\text{H}$. $\text{CH}_2\text{O}_2\text{S}$ reacts with Millon's reagent, even in the cold, reducing it to metallic Hg with formation of H_2SO_4 , NO_2 and HCO_2H . It does not react with HCl , H_2SO_4 , AcOH , and PtCl_4 . It combines with NH_3 with evolution of heat, without formation of a ppt. in either hot or cold soln. NH_3HS gives a white ppt. in the cold, while hot it gives a yellow ppt. of pure S which agglomerates and readily seps. With AuCl_4 , Au is pptd. ZnO dissolves (with the aid of heat) to a yellow soln. PbO is slightly attacked in the cold, and vigorously hot. Alk. carbonates are attacked either hot or cold with evolution of CO_2 . KMnO_4 reacts violently with evolution of gas, which seems to be O. With HNO_2 or NH_4NO_2 there is evolution of NO_2 , but with most nitrates (especially when there is possibility of the formation of an insol. sulfite) $\text{CH}_2\text{O}_2\text{S}$ splits off H_2SO_4 and CH_2O is liberated. It reacts with fuchsin and with aniline under various conditions giving rise to colored compds. which might perhaps be used in dyeing. The *germical power* was tested on *B. subtilis*, *B. staphylococcus*, and *B. coli*, in a peptone-broth medium, a comparison being made with com. Ca hypochlorite. It was found that 60 mg. of $\text{CH}_2\text{O}_2\text{S}$ would kill all the bacilli on 10 cc. of peptonized beef broth medium.

A. P.-C.

N,N'-Di(p-allyloxyphenyl)acetamide. J. SCHULER. U. S. 1,384,637, July 12. *N,N'-Di(p-allyloxyphenyl)acetamide*, colorless crystals, m. 85–86°, readily sol. in alc. and ether and insol. in H_2O , forming a hydrochloride, m. 152–3°, which dissolves easily in alc., is less sol. in H_2O and insol. in ether, is adapted for use as a local anesthetic in ophthalmological practice. It is prep'd. by condensing $p\text{-NH}_2\text{C}_6\text{H}_4\text{OCH}_2\text{CH}_2\text{CH}_2$ with $p\text{-AcNH}_2\text{C}_6\text{H}_4\text{OCH}_2\text{CH}_2\text{CH}_2$ in the presence of P_2O_5 or similar condensing agent.

Caffeine. SEMMATSU SHIRATORI. Japan 36,852, July 28, 1920. Addition to 32,780. Tea, 37.5 kg., is boiled with 27 l. H_2O for 6 hrs., filtered and the residue is treated again in the same way. The combined filtrate is evapd. to a thin sirup, which is then heated with 2 vol. benzene during 1 hr. under agitation. The benzene layer is sepd. from the aq. one and the solvent is distd. off. The greenish black residue is dissolved in hot H_2O , treated with milk of lime, filtered. On concn. of the clear filtrate, caffeine crystallizes out.

18—ACIDS, ALKALIES, SALTS AND SUNDRIES

FRED C. ZEISBERG

The production of sulfuric acid and acid phosphate at Trenton, Ont. ANON. *Can. Chem. Met.* 5, 220–3 (1921).—A chamber plant of 120 tons 60° acid per day capacity is described in considerable detail. A sulfuric acid concn. plant of 8 units is also described, as well as a 200 ton per day acid phosphate plant. F. C. Z.

Heat required in acid concentration. F. COLIN SUTTON. *Chem. Age.* (London) 5, 178–80 (1921).—The heat required to concentrate H_2SO_4 is divided into (1) heat for the evapn. of the H_2O driven off, (2) heat to overcome the affinity between H_2O and H_2SO_4 and (3) the sensible heat, i. e., that necessary to raise the soln. to the temp. where H_2O begins to evap. An additional factor, when the acid strength rises above 80% H_2SO_4 , is the heat absorbed to evap. some of the H_2SO_4 itself. Tables show the heat required to concentrate, in increments from 65 to 100% H_2SO_4 . An example showing a calcn. of the efficiency of a tower concentrator is given. A number of curves illustrate the article but have no connection with the text, being from Knietsch's well known article on the contact process and representing general properties of H_2SO_4 . On the other hand, curves mentioned in the text are missing in the article. F. C. Z.

Improvements in the ammonia-soda process. JAMES H. MACMAHON. *Chem.*

Age (N. Y.) 29, 364-6 (1921).—A description of the process covered by U. S. pat. 1,384,141. Cf. *C. A.* 15, 3727.

F. C. Z.

Alkalinity of Searles Lake brine. ROGER C. WELLS. *J. Ind. Eng. Chem.* 13, 691-2 (1921).—Supplements Teeple's article on operations of the American Trona Co., (*C. A.* 15, 1378). The brine was found to have H-ion concn. 3.32×10^{-10} (or $p_H = 9.48$), the alkalinity thus lying between the limits of solns. of Na_2CO_3 and $NaHCO_3$ on the one hand, and $Na_2B_4O_7$ and $Na_2B_3O_4$ on the other. Artificial brines were made up from solns. of $NaCl$, KCl and Na_2SO_4 , as a medium to which buffer salts could be added in varying amts., thus making the "salt effect" const. and equal to that in Searles brine. Sets of p_H detns. were made on this brine after addition of varying proportions of (a) $NaHCO_3$ and Na_2CO_3 and (b) $Na_2B_4O_7$ and $Na_2B_3O_4$, keeping total CO_2 and B_2O_3 equal to their values in Searles brine. It was shown that to have $p_H = 9.48$, 78% Na_2CO_3 and 22% $NaHCO_3$, or 71% $Na_2B_3O_4$ and 29% $Na_2B_4O_7$, must be present. These values correspond to a brine containing KCl 4.69, $NaCl$ 16.63, Na_2SO_4 6.98, Na_2CO_3 3.46, $NaHCO_3$ 0.77, $Na_2B_3O_4$ 1.39, $Na_2B_4O_7$ 0.43, H_2O 65.65%. W. C. E.

The colloids; their preparation, properties and applications. H. VIGNERON. *Génie civil* 78, 472-7, 496-500, 525-7, 545-8 (1921).—This is a semi-popular but interesting series of articles subdivided under the following headings: The colloidal state; prepn. of colloids; properties of finely divided solids; adsorption by solids; synthetic carbon; catalysis; the contact process; the Hargreaves-Robinson process, ($4 NaCl + 2SO_2 + O_2 + 2H_2O = 2Na_2SO_4 + 4HCl$). This takes place with 70% efficiency at 500-550° if 0.1-1.0% of a salt of Fe or Cu is present. 666°, the m. p. of $NaCl$, is the heat limit; the Deacon process, (a 65% yield of Cl is obtained by passing a mixt. of HCl and air over a porous substance satd. with $CuCl_2$, at 450-460°); the Chance-Claus process for recovery of S from Ca_3S ; the Haber process; the Ostwald process for the catalytic oxidation of NH_3 ; hydrogenation and dehydrogenation processes; surface-combustion; adsorption by liquids; adsorption of solns.; agglomeration of very fine materials; theory of peptization; elec. properties of colloids; coagulation; emulsions; applications of the colloids in agriculture, in medicine and in photography; colloids in the clay-working and in the petroleum industries.

JAS. O. HANDY

Causes of the burning through of a kettle used for the production of nitrite from nitrate by molten lead. A. LOTTERMOSER. *Chem. Ztg.* 45, 581 (1921).—The burning through of the kettle was, as shown by the character of the hole, from within rather than from without. The material of the kettle, gray cast iron, was ordinarily quite satisfactory for this work at the temp. used (400°). It was shown, however, that if the temp. was allowed to rise to 850° a violent reaction set in which was quite capable of causing damage similar to that actually observed. Shortly before the kettle burned out the agitator had been stopped for a few min. It is probable that in this time the temp. of the kettle wall and of the Pb in contact with it rose sufficiently to cause the violent reaction to take place, with consequent burning through of the kettle. D. W. M.

Briquetting mineral phosphates. W. H. WAGGAMAN, H. W. EASTERWOOD AND T. B. TURLY. *Chem. Met. Eng.* 25, 517-22 (1921).—An investigation of briquetting mixts. of Florida and Tennessee phosphates with coke, coal and peat as reducing agents in the production of H_3PO_4 by the volatilization process. The process is outlined, mech. and chem. problems are discussed, and the app. used in the prepn. of the briquets is described. A satisfactory binder will produce a briquet which is hard enough to withstand shocks and is practically waterproof, will maintain its binding qualities on heating, will increase the fuel value of the briquet and will compete with other fuels. Briquets may be made from mixts. of phosphate rock, sand and coke. Tabulated results show lower grade phosphates contain a high proportion of clay-like binding material and SiO_2 , offering a source of material to mix with high-grade phosphates.

Water is necessary to give the mass binding properties. Introduction of the water may be effected by sprays or atomizers, while the mass is constantly turned to prevent the formation of clay balls. But where the addition of both sand and coke are necessary the water is best mixed with these materials and then added to the phosphate rock. The moisture content should be 10-12%. Results show that where bituminous coal and peat are used as reducing agents, the former supplies 88% as much fixed C as is furnished by coke, and peat supplies only 58.7% as much. However, analysis of briquets contg. bituminous coal shows higher actual fixed C after ignition at 1000° than before. The deposition of C through the mass should insure quicker and more complete reactions between the ingredients in the furnace charge, allowing a reduction of 18% of the coal originally deemed necessary. Furnace tests of coal and peat binders are planned.

W. H. BOYNTON

Action of lime on greensand. R. NORRIS SHREVE. *J. Ind. Eng. Chem.* 13, 603-5 (1921).—A slurry contg. 1 part greensand, 1 part lime and 5 parts water is heated about 1 hr. in a digestor at 500 lbs. per sq. in. (temp. = 470° F.), liberating KOH and forming a Ca silicate (probably monosilicate) possessing cementing properties. From 61 to 81% of K present becomes sol. Fine grinding and agitation, adding Na and NH₄ salts, etc., with working conditions as given, resulted in max. yields, and gave at will K salts, with NaOH as by-product.

W. C. BRAUGH

"Cold sealing wax" in tubes. A. KRÜGER. *Seifensieder-Ztg.* 48, 661 (1921).—A warning that the so-called "cold sealing wax" does not keep in warm weather, since it consists of a soln. of celluloid in acetone, mixed with various mineral fillers, the solvent gradually evapg., leaving a useless, hard mass behind.

P. ESCHER

Cements for wood. P. MARTELL. *Seifensieder-Ztg.* 48, 703-4 (1921).—A collection of recipes for wood work.

P. ESCHER

Determination of sulfur dioxide in gases from roasting (BERL) 7. A liquid oxygen vaporizer (GRIFFITHS) 1. Thermodynamics and its application to the chemical industry (URBAIN) 13. Acid and alkaline decomposition of potassium cyanide (HÄRKE) 6.

Hydrocyanic acid. F. J. METZGER. U. S. 1,385,335, July 19. HCN is produced by the action of CO₂ upon crude or pure NaCN or other cyanide at a temp. of about 0-30° or 130-150° which prevents polymerization of the HCN formed. U. S. 1,385,336 relates to a similar process in which the HCN formed is withdrawn from the reaction zone at such a rate as to preclude polymerization.

Sulfuric acid by the contact method. H. F. MERRIAM. U. S. 1,384,566, July 12. La. S is burned to produce SO₂ in mixt. with O₂ and the mixed gas is passed over a catalyst until a 97-98% complete conversion has been effected and the SO₂ produced is then absorbed. The gas is maintained at a temp. not materially below that suited to the formation of SO₃ from the burning of the S until the SO₃ has been formed.

Ammonia-soda process. J. H. MACMAHON. U. S. 1,384,141, July 12. Water gas is sep'd. into H and CO, the H is combined with N to synthesize NH₃ and the latter is absorbed in brine for use in the ammonia-soda process. The CO is burned to produce CO₂ and the latter is used in the carbonating towers of the ammonia-soda process.

Antimony trichloride. O. C. RALSTON. U. S. 1,384,918, July 19. SbCl₃ is made by passing gaseous Cl into contact with metallic Sb beneath an overlying body of molten anhydrous SbCl₄.

Acid sodium pyrophosphate. A. KELLY. U. S. 1,383,990, July 5. Na pyrophosphate is treated with HCl to convert it into acid Na pyrophosphate and the latter is pptd. by salting out. Cf. *C. A.*, 15, 2531.

Manufacture of sodium nitrite from sodium nitrate. YOSHIHIKO OKAE. Japan

37,034. Aug. 30, 1920. By reduction with BaS in the hot, with Zn dust as catalyst, NaNO_3 produces NaNO_2 in good yield without explosion or decomprn. On heating under agitation, a mixt. of 1 kg. NaNO_3 , 2.1 l. of 25° Bé soln. of BaS free from C and org. compds. and 0.8 g. Zn dust becomes a brown paste, then a yellow powder; this is further agitated at about 450° to a yellow-white paste, cooled and extd. with H_2O . The filtrate is concd. to 47° Bé; 96% content NaNO_2 seps.

Decomposition of silicates. RITARŌ HIROTA. Japan 37,165. Sept. 25, 1920. Silicates, such as clay, feldspar, etc., are easily decomposed by heating with Na_2CO_3 or similar compd. and then treating with dil. H_2SO_4 or similar compd. E. g., a mixt. of clay 100 parts and Na_2CO_3 70 is heated to dull redness for 1 hr., the product is heated with excess of 20% H_2SO_4 at about 100° during 1.5 hrs. K_2SO_4 and $\text{Al}_2(\text{SO}_4)_3$ thus produced are extd. with H_2O and pure SiO_2 remains in the residue, 95% of the clay is utilized.

Selenium oxychloride as a solvent. V. LENHER. U. S. 1,385,081. July 19. SeOCl_2 is proposed as a solvent for widely diverse substances. Common metals such as Al, Zn, Fe, Pb and Sn are dissolved by SeOCl_2 as are also many non-metallic elements such as Se, S, I, Te and P. Si and B are not dissolved. Unsatd. hydrocarbons generally react with SeOCl_2 and it dissolves aromatic hydrocarbons such as C_6H_6 and toluene but is without action on satd. hydrocarbons of the paraffin series. It may thus be employed as a reagent for the sepn. and purification of various hydrocarbons. Charcoal may be activated for gas-absorption by the action of SeOCl_2 . Rubber (either before or after vulcanization) is dissolved by SeOCl_2 as are also phenolic-formaldehyde condensation products of various kinds either in their fusible or infusible conditions, natural resins, glues, gelatin, celluloid, varnish, lacquers and paints generally so that SeOCl_2 is adapted for use as a paint or varnish remover. SeOCl_2 attacks and dissolves proteins, including wool, silk, hair, bristles, leather and similar substances but in the presence of H_2O it reacts very poorly or not at all upon starch and cellulosic materials. With linseed oil and fish oil, SeOCl_2 yields products which are waterproof and rubber-like in character and with other oils various products suitable for use as substitutes for rubber and resins are obtained, the products generally being insol. in ordinary solvents. It may also be used in the same manner as CCl_4 as a fire-extinguisher. It is sol. in both CCl_4 and CHCl_3 . These two substances may be added to SeOCl_2 to lessen its powerful solvent action. SO_2 increases the solvent power of SeOCl_2 when added to it.

Selenium from copper slimes. TSUTOMU SHIOMI and KENZŌ OZU. Japan 36,929, Aug. 11, 1920. By warming Cu slimes with 15% NaOH, the SeO_2 in the material goes into soln., while Se, Cu_2Se or other selenides remain in the residue. The residue is heated with 1.5 parts KNO_3 , to convert Se and selenides to SeO_2 , which is dissolved by warming with 15% NaOH or 10% H_2SO_4 or HCl. By decantation, all the soln. is collected, filtered and acidified with H_2SO_4 or HCl. When H_2SO_4 is used for the second extn., Ag is dissolved. It should be pptd. by NaCl or HCl and sepd. Selenic acid or its salts are changed to selenious acid or its salts by adding excess of concd. HCl or NaCl, from which metallic Se is pptd. by passing SO_2 or adding Na_2SO_3 or Cu, Fe, Al, Zn, etc., as usual.

Reclaiming spent metal-pickling solutions. J. A. SHAW. U. S. 1,384,974, July 19. Spent pickling soln. containing FeSO_4 is treated with NO_2 and O in order to produce $\text{Fe}_2(\text{SO}_4)_3$ and the gaseous material resulting from this treatment is subjected to the action of a scrubber for recovery of N oxides, e. g., by reaction with CaCO_3 or $\text{Ca}(\text{OH})_2$.

Nitrogen from the air. L. CASALE. U. S. 1,384,428, July 12. See Brit. 148,885 (C. A. 15, 295).

Decolorizing-carbon. M. B. PUNNETT and R. A. WHITAKER. U. S. 1,383,755, July 5.—A decolorizing-carbon is prep'd. by adding to 100 parts of hardwood sawdust 100 parts of a 75% soln. of niter cake in H_2O , allowing the mass to stand for 2 hrs. or

somewhat longer, drying and charring the mass by heating it in the open air to 300–500° while stirred in thin layers for 0.5–1 hr., cooling, adding sufficient H₂O to dissolve out the sulfate salts, boiling, filtering, drying, grinding, then heating in a closed retort to 800–1000°, cooling to below the ignition temp. and regrinding. A similar method may be applied to the production of decolorizing-carbon from straw, coconut shells, cohune nuts, vegetable ivory nuts, paper and nut-gall-pulp obtained as a residue in the manuf. of pyrogallic acid.

Compacting carbon particles. C. J. RANDALL. U. S. 1,384,089, July 12. C particles such as are used in compounding with rubber are enclosed in a bag submerged in liquid, e. g., H₂O, in a closed container. Air is exhausted from the container and escape of gas from between the particles in the bag is permitted and then the liquid and bag and contents are brought under sufficient fluid pressure to compact the material in the bag.

Purification of graphite. SADAKICHI ATAKA. Japan 37,172, Sept. 28, 1920. Graphite ore is ground, washed with H₂O to eliminate clay and immersed in a suitable quantity of H₂O, to which petroleum (in the ratio of 72 l. petroleum for 1 ton product) is added under agitation. When the oil has penetrated into the scales, the whole is thrown into a slow current of H₂O, in which impurities ppt. and graphite floats. The collected scaly graphite is scattered on an iron plate heated to redness. By evapn. of the petroleum the scales are sepd. into thinner scales, which causes sepn. of mica or fine sand.

Acid-resisting receptacle. H. EVERKEN. U. S. 1,384,023, July 5. An acid-resisting receptacle adapted for holding hot concd. HNO₃ or H₂SO₄ is formed with an inner wall of acid-resisting cast alloy of Si and Fe, an outer wall spaced from the inner wall and formed of cast Fe and a filling of Pb between the inner and outer walls.

Chemical heater. G. E. FERGUSON. U. S. 1,385,074, July 19. A chemical heating device adapted for repeated use is formed of a container such as sheet metal within which is placed a soln. of NaOAc and Na₂S₂O₃ or similar crystallizable salts with an overlying seal of paraffin and lanolin or other material of about the same m. p. as the salt soln. but of lower sp. gr., so that on heating and cooling it will solidify on the salt soln. and hold it against agitation and prevent crystn. regardless of the position of the container until the seal is broken intentionally. U. S. 1,385,075 also relates to control of crystn. of solns. of salts by similar means.

Chemical heater. L. E. ECKELMANN and G. E. FERGUSON. U. S. 1,384,747, July 19. A chemical heater is formed of a receptacle which may be made of sheet metal containing a crystallizable salt soln., e. g., NaOAc and Na₂S₂O₃, and a sealing material (such as paraffin and lanolin) of less sp. gr. than the salt soln. and adapted to solidify on cooling and prevent crystallization while the seal which it forms remains intact. A device for breaking the seal extends through the wall of the receptacle for operation at will to break the seal and permit the soln. to crystallize. The device is adapted for use in the manner of hot water bottles.

Enamelled wire. SHUKUSABURŌ MINATOYA and the COMMUNICATIONS DEPARTMENT OF JAPAN. Japan 37,210, Oct. 4, 1920. A mixt. of 10 parts purified fatty acids, concd. by heating 20 parts colloid-coagulating reagent, such as camphor, borneol, naphthalene or phenol, and 5 parts mineral rubber, is dissolved in a small quantity of oil of turpentine. Metallic wire is painted with the soln. and baked at about 250°. The operation is repeated until a suitable thickness is obtained. The film is resistant to mechanical action and is a good insulator.

Reclaiming files or rasps. J. H. A. D. BOWMAN. U. S. 1,384,550, July 12. Files or rasps are resharpended by immersing them in a dil. soln. of HCl and HNO₃ or a similarly acting acid soln. which evolves a gas adhering to the projections of the metal

and by thus protecting them permits a somewhat selective chem. action on the grooves or depressions on the tool. The tools are first treated with cleaning and pickling solns.

Coating for stereotype matrices. O. STRUENSEE. U. S. 1,385,284, July 19. A mixt. formed of talc 10, corn flour 2, gum arabic 0.5 and dil. CH_3O soln., in H_2O 30 parts, is used for coating stereotype matrices in order to render them capable of repeatedly giving good reproductions with cast metal.

Friction composition for use on pulleys. D. M. BENFORD. U. S. 1,383,692, July 5. A friction compn. adapted for use on pulley faces is formed of water-floated ground glass and Na silicate soln. or other similar hard-drying liquid.

Plastic material from animal protein. SADAKICHI SATÔ. Japan 37,025, Aug. 30, 1920. When a mixt. of animal protein and an anhydrous compd., which generates CH_2O by heating, such as formamidine, paraformaldehyde, etc., is heated under pressure, the protein combines with the generated CH_2O , forming a methylene compd., which is easily dried and suitable for manufg. insulating materials, etc. Casein, e. g., is heated with small quantity of NH_4OH to a sticky mass and mixed with 10% (as formaldehyde) formamidine on a rolling machine, heated at 90-120° for 5-30 min. under pressure and dried at 30-35°.

Plastic material from soy bean. YÔJIRÔ MARUYAMA. Japan 37,159, Sept. 24, 1920. The soy bean is immersed in H_2O during 10 hrs., ground, the liquid thus obtained is boiled and sepd. from coarser substances, and 3% FeSO_4 in warm H_2O is added under agitation. One part of protein forms an iron compd. and the whole coagulates, together with the fats. The product is separated from H_2O by pressing in a hydraulic press for 6-8 hrs., cut into suitable thickness, dried gradually at 35-40°, then at about 80° for 42-168 hrs., then boiled with 2% CaO soln., set in a mold, pressed under 20-30 lbs. pressure, dried in air and wiped with NaOH soln. If 3-5% camphor in alc. is added to the original soln., the product is more elastic.

Tailors' chalk. A. ANDER and F. T. McGUIRE. U. S. 1,384,375, July 12. A plastic clay is mixed with a pigment or coloring material and the mixt. is formed into cakes and dried at a moderate temp. and then submerged in an oleaginous material, e. g., vegetable or mineral oil, until impregnated, and finally dried to obtain a product suitable for use as a tailors' chalk.

Paste. D. M. PHILLIPS. U. S. 1,384,917, July 19. A non-staining paste adapted for use with delicate fabrics is formed of H_2O 1 pint, rice flour 8 oz., corn starch 4 oz., gum arabic 1 dram, glycerol $\frac{1}{2}$ dram, oil of cloves $\frac{1}{4}$ dram and oil of cinnamon $\frac{1}{4}$ dram.

19—GLASS, CLAY PRODUCTS, REFRactories AND ENAMELED METALS

G. E. BARTON, C. H. KERR

Glass blowing in scientific and industrial laboratories. H. VIGREUX. *Chimie & industrie* 6, 160-8(1921).—Brief historical sketch of the development of glass blowing together with hints on glass blowing, the difficulties encountered by the beginner, and the method of overcoming them. A. P.-C.

New Bergman gas and air valve described. HENRY W. HESS. *Glassworker* 40, No. 51, 11(1921); 2 illus.—“This valve is unique and practical in that the gas and air are reversed by the same operation and simultaneously, either by hand or automatically, being controlled by clock work and motor or by a thermostat placed in the checker work of the regenerators. This latter is a most essential and valuable feature, and greatly facilitates the regulation of even temps.” The valve is circular in shape, brick-lined,

water-sealed, and is divided into 6 segments. The duration of reversal is 10 seconds, during which time the valve passes through an angle of 120°. J. B. PATCH

Furnace for revolving pots. ANON. *Nat. Glass Budget* 37, No. 21, 1-2(1921).—A description of a test of a Chapman-Stein recuperator applied to an Owens revolving pot. The temp. of the waste gases entering the recuperator was 1550° F. The temp. of the air coming from the recuperator was 1300° F. The temp. of the gases entering the stack was 650° F. If the distance between the furnace and recuperator had been less the initial temp. of the waste gases would have been higher; nevertheless the figures show the efficient transfer of heat of the waste gases to the incoming air. The recuperator is said to be capable of maintaining a very const. temp. For 24 hours the temp. readings of the furnace showed a max. variation of 40° F. from the mean temp. However, this is not nearly as close a regulation as is possible and not even as close as the engineers guarantee. In another test under different circumstances a max. variation of $\pm 10^{\circ}$ F. was obtained. The Stein recuperator is said to be especially valuable in connection with pot furnaces. In Europe it has not only reduced the fuel consumption of such furnaces nearly $1/2$, but it has also nearly doubled the av. life of the pots. J. B. P.

The Mathews reverberatory furnace. ANON. *Nat. Glass Budget* 37, No. 18, 1, 20-21(1921).—A detailed description without diagrams of a recuperative gas-fired pot furnace, largely in the language of the patent. J. B. PATCH

Properties and tests of tiles. ANON. *Kalk, Gips u. Schamotte-Ztg.* 27, (Nov. 21, 1920); *Chimie & industrie* 6, 206(1921).—There are as yet no official standards for tiles; and moreover their properties vary within very wide limits according to the method of manuf., e. g., the crushing strength can vary from 25-250 kg., the lower values being found with hand-made tiles. Certain dealers and municipalities have adopted regulations varying according to the nature and shape of the tiles and covering the amt. of H_2O absorbed, tightness to water, content of noxious substances, apparent sp. gr., d., fragility, resistance to the action of frost, uniformity, and color. Certain of these properties can be easily gaged, while others require special tests carried out on the roof itself. A. P.-C.

Chemical stoneware manufacturers. CHESTER H. JONES. *Chem. Met. Eng.* 25, 289-94(1921).—The product must be completely vitrified in order to resist mechanical shocks, temp. changes and acid attack. Clays used require high bonding strength, small drying and burning shrinkage and a rather wide range of vitrification. Dry grinding is used in preparing the clay. It gives a more suitable product than a wet process. Ageing for varied periods as long as six months follows. The drying and firing shrinkage averages 10%. Wm. M. CLARK

A method for the determination of the hardness of refractory materials at high temperature. E. RENGADE AND E. DESVIGNES. *Compt. rend.* 173, 134-7(1921).—Ludwick's modification of the Brinell test for hardness was applied to 8 clay bricks and 1 bauxite brick maintained at temps. varying from 1050° to 1490° in a graphite resistance furnace. Analyses of the compns. show that the Al_2O_3 content has small effect, but that the presence of alkalies causes considerable diminution in the hardness values. Wm. M. CLARK

The repair of crystallized glass apparatus (BAILEY) 1. Use of acetylene in glass-blowing (COOLIDGE) 1.

Metal coating on glass. J. RHEINBERG. U. S. 1,385,229, July 19. A mirror coating on glass is formed by coating the glass with a dry film of collodion contg. Pt, Pd or Ir and Pb or Bi salts and then heating the coated glass to a temp. of 500-750°. Cf. *C. A.* 15, 1791.

Furnace for manufacturing tile. TÔDA MOROTA. Japan 37,173, Sept. 28, 1920.

The furnace has 2 doors opposite each other. Flames are conducted to the top of the furnace, then to the inner part through shelves on which tiles are placed.

Baking porcelain insulators. MAGOEMON EZOE. Japan 37,166, Sept. 25, 1920. The porcelain insulator is set in a round flat box and baked, the top of the insulator being completely covered with glaze.

20—CEMENT AND OTHER BUILDING MATERIALS

C. N. WILEY

Porous cements. C. PLATZMANN. *Zement* 9, 589-92(1920); *Chimie & industrie* 6, 206(1921).—The use of cement concrete for dwellings presents two drawbacks: nails cannot be driven into the walls, and the insulation against heat and sound is defective. These drawbacks are not present in very lean concretes or in concretes made from cinders. U. S. pat. 1,087,098 (C. A. 8, 1337) covers the production of artificial stones by adding 0.1-0.5% Al powder or 2-3% Zn powder to the cement-sand-water mixts. In the presence of H₂O these powders liberate H₂ which, according to the patent, swells up the mixt. as though 3 times as much cement had been used. Moreover, the addition of 0.25-20% of CaO facilitates the formation of zincates and aluminates. In tests carried out in Germany a max. increase of 130% in vol. was found with 0.1% Al after 37 hrs. Mechanical tests (probably tensile strength—ABSTRACTOR) carried out in connection with the addition of 0.1% Al gave 69, 75, 63, 47, 17, and 7 kg. per sq. cm. with 25, 30, 40, 50, 75, and 85% of sand, resp. Owing to the rapid decrease in strength with increase in the proportion of sand this process is scarcely recommendable, in spite of the fact that the wt. of cement was smaller than was expected. A. P.-C.

A critical review of the wet process for manufacture of Portland cement. RICHARD K. MEADE. *Concrete* 18, Mill Section, 77-85(1921).—A detailed analysis is given, based on considerable data, whether the wet or dry process is best for the manuf. of Portland cement from hard, dry, raw materials. F. H. HOTCHKISS

The equipment and operation of Brooklyn Crozite brick plant. ANON. *Concrete* 18, 74-8(1921).—This plant is of special interest as a products manufacturing achievement in the elimination of manual labor. Its working capacity is 100,000 concrete brick per 8-hr. day. In recent tests concrete brick show a remarkable superiority over clay brick, as well as an unusually uniform quality. F. H. HOTCHKISS

Further tests on concrete oil-storage tanks. ANON. *Concrete* 18, 110(1921).—The effect on concrete of certain organic oils is greater than that of mineral oils. The tannic acid content of the oil is injurious to concrete. The use of concrete tanks under ordinary conditions, while allowable for fuel oil, is not recommended for kerosene and gasoline. F. H. HOTCHKISS

The analysis of fibro-cement. B. J. SMART. AND P. C. PECOVER. *J. Soc. Chem. Ind.* 40, 185-6T(1921).—S. and P. det. the approx. % of cement in cement-asbestos mixts. by treating with 20% HCl and detg. the Ca in the ext. The asbestos adsorbs some SiO₂; hence high results are obtained for the asbestos by direct weighing of the residue. The adsorbed SiO₂ can be extd. with "alkali." E. G. R. ARDACH

The cement factory in Torda (Siebenburgen, Hungary). H. SZEKELY AND E. HAVAS. *Beton u. Eisen* 20, 41-3, 66-9, 87-90(1921).—Dimensioned drawings give many details. The thick slime process of Smith & Co. is to be used. Limestone and argillaceous schist are the raw materials. Natural gas is the fuel. JAS. O. HANDY

Researches on the volume alteration of cement and cement mortars on setting; influence of water addition, the method of mixing and of the cement on the extent of the volume changes; the relation between the length of iron reinforcement and the

setting of cement mortar; the rate of expansion and contraction of natural stone when wet and dried. OTTO GRAF. *Beton u. Eisen* 20, 72-4 (1921).—A continuation of an undated earlier article. Cf. C. A. 8, 811. JAS. O. HANDY

The effect of coal on concrete. ANON. *Concrete* 19, 53 (1921).—Coal should not be regarded as inert; storage of coal in large quantities may result in spontaneous combustion and cause serious damage to the container. The heat and pressure produced are likely to cause cracks in concrete. Also free H_2SO_4 is formed, setting up a dangerous condition. F. H. HORCHKISS

Utilization of steel-furnace slag for cement manufacture. EICHI SHINNA and KOBE SIKOKO CO. (Kobe Steel Manufg. Co.). Japan 37,153, Sept. 24, 1920. Steel furnace slag is introduced into water while still liquid. By this means, free steel in the slag is formed into globules and the whole is cracked. The product is mixed with 10-25% lime or dolomite, crushed in a ball mill and the slag sepd. from the steel. The powdered slag is used as a cement.

Plaster composition. M. K. ARMSTRONG. U. S. 1,381,037, July 12. A plaster compn. is formed of calcined gypsum 85 and finely divided peat or peat moss 15 parts, mixed with H_2O to form a workable plastic mixt. Cf. C. A. 15, 1207.

Waterproofing concrete. R. G. OSBORNE. U. S. 1,383,739, July 5. Concrete is rendered impervious to fluids by heating it to a temp. of about $200-250^\circ$ to drive off part of the H_2O of combination and then filling the voids of the material with asphalt or other waterproofing substance.

21—FUELS, GAS, TAR AND COKE

A. C. FIELDNER

The possible applications of lignitic brown coal. M. DOLCH. *Min. u. Rundschau* 13, 170-3, 185-9, 206-8, 228-31, 249-51, 267 (1921).—As the av. sample of lignite shows about 38% water, it can only be used in the vicinity of the mine in the crude condition. By briqueting the water can be reduced to about 10%. Drying by heating at $280-340^\circ$ is too expensive to be practical. Effort to form tar and gas would be economical only if the by-products, which could be obtained from the gas and tar were of high value. The ordinary brown coal can be used to give gas and tar from which by-products of value might be extd. Again the brown coal could be distd. to semicoke. The products are a high-value fuel gas, a high-value tar and a low-value coke. The coke occurs mostly as fines, so that until some means of briqueting is found, it is not an important article of commerce. The tar has the properties of crude oil and can be used in a similar manner as a fuel. It also can be distd. to give fractions of gasoline, vaseline and paraffin. Semicoke can be used in industry as a raw material from which the remaining gas can be driven off and the coke left used in metallurgy. This gas is useful for heating purposes. The fines resulting in any of these processes can be used along with the crude coal briquets in firing and this combination burns with high efficiency. The semi-coking process is the most promising application. H. BUTTLER

Anthracoal, a new domestic and metallurgical fuel. DONALD MARKLE. *Trans. Am. Inst. Mining Met. Eng.* 1921, No. 1086-C, 11 pp.; *Coal Age* 20, 296-9 (1921); *Iron Trade Rev.* 69, 753-5 (1921).—Anthracoal is a mixt. of small particles of anthracite coal and a matrix of practically pure carbon, formed in the distillation of coal-tar pitch and other suitable bitumen. It is a homogenous mass and its color varies from silvery to grayish black. It develops only slightly the finger-like structure of coke, but unlike coke it has the tendency to form blocky masses. When coked it produces very little fines. It can be made from flake-pitch and anthracite coking in regenerative non-recovery

ovens. The volatile products are not worth recovering, so all the gases are used for the heating, thus making the process practically self-supporting in the matter of heat. By direct comparison between chestnut-size anthracite and chestnut-size anthracite coal in an 8-day test in a kitchen range, it was found that the relative efficiency of anthracite to anthracite is 100 to 80.

H. BUTTLER

Conditions under which bulk oil concentration of fine coal gives best results. G. Sr. J. PERROTT AND S. P. KINNEY. *Coal Age* 20, 172-5(1921); 1 illus.—The mineral matter is best sepd. from the combustible matter when the oil used has a low viscosity and the coal is ground not finer than 200 mesh. This bulk oil concn. method of the Trent Process Corporation will reduce the ash 26 to 75% in anthracite or bituminous coals and will reduce the S in anthracite coals better than in bituminous coals. Lignite does not give good results unless the structure is first broken down by heat.

H. B.

Evaporation tests in boilers fired by brown coal. ANON. *Arch. Wärmewirtschaft* 2, 78-80(1921).—A discussion and table of a series of tests of the efficiency of lignite in different under-draft boilers.

H. BUTTLER

Coke fuel for water heating. K. LIDBERG. *Gas J.* 155, 543-4(1921).—Results are given of tests carried out on a specially constructed water-heating plant at the Stockholm Gas Works. In the amt. of useful heat realized, there is not much difference, under proper regulation, between coke made in Glover-West vertical retorts (79.3%), hand-charged horizontal retorts (76.8%), Dessau vertical retorts (81.5%), and chamber retorts (81.5-83), nor between coke properly dry or wet quenched. A high-density coke free from breeze and dust and with a low content of ash and moisture has an advantage, however. The % of useful heat falls in correspondence with the size of the coke; the fall being due wholly to the rapid increase of CO and, therefore, loss of heat. This loss is almost independent of the rate of combustion; the reverse is true as regards temp. losses, which are independent of the size of the coke, but increase with the rate of combustion. The design of boilers also affects the question of losses. Therefore, the coke should be graded in size according to the water-heater or boiler in use. Air regulation also is important. Efficiency is related not only to the temp. of the spent gases but also to excess of air, and both require an equal degree of consideration in selecting the most suitable size of coke for a given boiler.

J. L. WILBY

Peat at the Exposition for Waterways and Energy-economy at Münich. ANON. *Chem. Ztg.* 45, 772-3(1921).—A description of the peat industry display, pointing out difficulties in dewatering peat, and recently developed processes for making its com. use feasible.

W. C. EBBAUGH

Coal distillation "trees." ANON. *Chem. Ztg.* 45, 773(1921).—A comparison of distn. products from coal and lignite. Illustrated.

W. C. EBBAUGH

The products of coal distillation. The plant and methods of the Cie des Forges et Acieries de la Marine et d'Homecourt aux Usines de Boucau, (Basses-Pyrénées). A. GRÉBEL. *Génie civil* 78, 449-54(1921).—In the 90-oven Coppee by-product plant described silos holding 20,000 tons are used for coal storage. 600 tons of coal are coked in 24 hrs. Two photographs and ten diagrams of parts of the plant are shown. The operations are described as follows; the ovens; condensation; semi-direct recovery of NH₃ as sulfate; benzene recovery and rectification; tar distn. The recovery of NH₃ is 99% and of benzene 90%.

JAS. O. HANDY

Motor fuel from vegetation. T. A. Boyd. *J. Ind. Eng. Chem.* 13, 836-41(1921).—B. outlines the present conditions in the gasoline industry, and shows how benzene and alc. solve the problem of the future supply of motor fuel. According to the U. S. Geol. Surv., our petroleum reserves will be exhausted in 13 yrs.

J. L. WILBY

Role of the chemist in relation to the future supply of liquid fuel. HAROLD HIBBERT. *J. Ind. Eng. Chem.* 13, 841-3(1921).—The problem of a future supply of liquid

fuel depends upon the production of alc. The treatment of cellulosic and starchy materials and their conversion into alc, by action of fermenting organisms appear to solve the problem (cf. Pringsheim, *C. A.* 6, 2632). It is claimed as a result of expts. undertaken by Boulard (cf. *C. A.* 13, 246) that starch may thus be converted directly into alc., and that yields of 39 to 44 l. of pure alc. can be obtained from 100 kg. of grain as compared with 27 to 33 by the acid and 34 by the malt process. **J. L. WILEY**

Synthetic alcohols and liquid fuels. G. C. CALVERT. *Chem. Age* (London) 5, 153 (1921).—C. has developed a method of converting C into water gas and mixing with other gases according to the product desired. Utilization of wood waste, charcoal, or carbonizable tropical matter should yield fuel methyl alcohol at \$19.00 ton. Details of the process are withheld. The ratio of efficiency of MeOH to gasoline for use in internal-combustion engines is 5-4. **W. H. BOYNTON**

Coal wastage in tank boilers. Its cause and prevention. W. H. CASMEY. *Textile Mercury* 65, 168; *Chem. News* 123, 93-4 (1921).—Whatever types of tank boilers are used, the factors governing their duty and efficiency are: (1) The correct proportion of air and coal to give the highest workable furnace temp., approx. 2750° F. The chief factor contributing to coal wastage is excess air over that required for practical combustion; for good steam practice the ratio should be 18 to 1. (2) A standard ratio of 2 to 1 between the size of grates and smallest section area through which the products of combustion are to pass, between the ends of the furnaces and chimney bottom; depth of bottom flue half diam. of boiler; width of side flues $\frac{1}{7}$ diam. of boiler. With the above conditions, there will be no difficulty in obtaining an overall efficiency of 80% or more. **J. L. WILEY**

Development of a powdered-coal plant. CHARLES LONGENECKER. *Blast Furnace and Steel Plant* 9, 567-9 (1921).—L. discusses the bearing of the following factors upon the economical operation of the plant: grade of coal, motive power, equipment, type of furnaces, personal factor, % of time the plant is operated, and output of the furnaces. **J. L. WILEY**

Experimental comparison of a preheated-air furnace with a direct-fired furnace. O. LEBLÉP. *Am. Gas J.* 115, 247-52, 260-63 (1921).—The saving of fuel due to preheated air depends upon the working temp. of the furnace, and the temp. of preheat. The higher the furnace temp., the more pronounced the gas saving effect of preheated air; for example, with the exptl. furnace, with a preheat temp. of 1200° F. and a furnace temp. of 1400° F. the saving was 20.1%, with 2400° F. of preheat and a furnace temp. of 2800° F. the saving was 54.4%, or almost proportional to the temp. of preheat. It does not pay generally to use preheated air for city gas in furnaces operated below 1800° F., especially if the av. gas consumption is below 500 cu. ft. per hr. It is more justified for high temp. furnaces provided the waste heat can be directed into the heat-exchanging system. Cast-iron recuperators have a short life if used above red heat and, therefore, cannot be used efficiently in high-temp. furnaces. With 2600° F., a reversible checkerwork air preheater may cause twice the fuel saving that a cast-iron recuperator does. The application of air pre-heating should be made only after careful study, as in most cases it does not pay for industrial city gas furnaces. **J. L. WILEY**

Vegetable oils for internal-combustion engines. R. E. MATHOT. *Engineer* 132, 138-9 (1921).—Palm, cottonseed, peanut and sesame oil were used. So-called semi-Diesel engines, whether they be of the 2- or the 4-stroke cycle type, will work perfectly well with vegetable oils. **C. J. WEST**

Flame. C. A. FRENCH. *J. Soc. Automotive Engineers* 9, 182-88 (1921).—The requirements and characteristics of the inoffensive variety of combustion are considered and 9 sp. remedies are given for use in accomplishing the burning of heavy fuel in present engines. It is likely that kerosene and gasoline can be more effectively burned

by stratifying the mixt. so that ignition occurs in a very rich portion which burns out into an excess of air or a supporting atm.

C. J. WEST

The advantages, production, and cost of Natalite, motor fuel. ANON. *Intern. Sugar J.* 23, 147-53, 213-16, 266-70, 386-92 (1921).—One of the most promising substitutes for gasoline is Natalite (*N*) which consists of a mixt. of 55 parts of EtOH, 44.9 parts of Et₂O and 1 of NH₃ to neutralize acids formed on combustion. It is said that *N* can be made more cheaply than either benzene or gasoline; it has been made for 14 cents per gal. from molasses costing 2 cents per gal. The largest *N* plant is at Merebank, Natal, where 45 tons of molasses are mashed daily. Pure cultures of yeast are used in the fermentation process, and a wash contg. 8% alc. is obtained. The Et₂O is manufd. under the Annaratone process, which is continuous and automatic. The app. consists of a superheater where the alc. is heated under a pressure of 40 lbs. of steam. Here it is volatilized and sent to an etherifier, which consists of a lead-lined cylinder filled with balls, over which H₂SO₄ drops continuously. From here the Et₂O vapors pass to a saturator or washer. The vapors are neutralized and sent to the rectifier. Only 7 men are required to operate a plant mashing 45 tons of molasses per day.

W. L. OWEN

Application of scientific methods to increasing the efficiency of the gas industry W. NEWTON BOOTH. *Gas J.* 155, 601-6 (1921); *Gas World* 75, 209-13 (1921).—Lecture. Increased efficiency must be obtained both by more careful and scientific operation of existing plants, and by adoption of improved design in plants. The plant of to-day is only about 50% efficient; gas-making efficiency is calcd. as the ratio of thermal units produced as gas to the total units used in production. This can be corrected somewhat by recovery of waste heat (cf. Stewart, *C. A.* 15, 2711), elimination of stand-by losses in plant operation, decreasing heat radiation from the retort walls by careful insulation, and construction of recuperators with a view of increasing the heat conduction. In construction of new plant, developments should be in the direction of increased thermal efficiency of production. Up to the present time, the highest total efficiencies are reached in complete-gasification plants and future progress will probably be made in this direction. Gas-making processes would also be revolutionized by the use of a cheap supply of O in the gas-producer process. (Cf. Hodzman and Cobb, *C. A.* 14, 2408.) In order to be practicable, a plant must produce O at a price not to exceed 1 s. per 1000 cu. ft. Claude's air-liquefying and rectifying plants (described) would accomplish this, as would also the Jefferies-Norton process (*C. A.* 15, 1204). It should prove feasible to deliver a gas with up to 10% of pure O for the production of high temps, and to increase the efficiency of incandescent mantles. Another possible development from this, in connection with purification, is the production of liquid CH₄ for motor fuel.

J. L. WILLEY

Fused ash gas producer. ANON. *Chaleur et industrie* p. 79, Feb. (1921); *Industrie chimique* 8, 321 (1921).—Description of a producer in use at the Georgsmarienhütte. It is of the cylindrical blast-furnace type, the feed is of the usual type, and the air is pre-heated by means of the gas. Two taps, one above the other, are provided in the bottom of the producer, which is fed with coke mixed either with basic slag or some sort of ferrous slag. There results a small amt. of Fe rich in P and Mn and a very fluid slag, which is drawn off every 4 hrs., while the Fe is drawn off every 8 or 12 hrs. The consumption is 30 t. of coke per 24 hrs., and the producer can run 12-13 mos. without needing to be rebuilt. The gas has a calorific value of 1,133 cal., contains less than 1% CO₂ and less than 15 g. H₂O per cu. m., has a combustion temp. 85° higher than producer gas made from coal, and gives a yield of 5 cu. m. per kg. of coke.

A. P.-C.

Absorption of hydrocyanic acid. J. G. TAPLEY. *Gas J.* 155, 589-90 (1921);

Gas World 75, 234; cf. *C. A.* 15, 3384.—The process consists in passing the gas through ordinary chalk; the lab. expts. show that 1 ton of chalk will purify 11 million cu. ft. of gas. Chalk sprayed with water is more efficient than dry chalk. Further trials are to be made on a small com. plant to ascertain the effect of mixing breeze with the chalk to reduce back-pressure, and also whether wetting with ammoniacal liquor will have better results.

J. L. WILEY

The recovery of hydrocyanic acid and carbon disulfide from coke-oven gas and from illuminating gas. M. MINOT. *Chimie & industrie* 6, 135-40(1921).—After explaining the reasons why it is advisable and necessary to remove HCN and CS₂ from coke-oven and illuminating gases, M. describes a method of effecting this recovery and discusses its merits. The cold gas, after extn. of the tar, is washed with a Na₂S₂ soln. having an alkali content corresponding to 80 g. Na₂S per l.; it is prepd. by treating the spent oxide with a Na₂S soln., which dissolves out the free S and regenerates the oxide. A higher sulfide than Na₂S₂ is permissible. The polysulfide soln. readily absorbs NH₃, which reacts with the S (HCN + NH₃ + S = NH₄CNS), and the CS₂ reacts with the (NH₄)₂S to give thiocarbonate ((NH₄)₂S + CS₂ = (NH₄)₂CS₂). There are also secondary reactions: the CO₂ in the gas gives Na₂S₂ + CO₂ + H₂O \rightarrow Na₂CO₃ + H₂S + S₂ (1) while the O in the gas gives 2Na₂S₂ + 3O₂ = 2Na₂S₂O₃ + S₂. Reaction (1) is balanced; but as the CO₂ content of the gas is about 8 times greater than the H₂S content, the equil. is moved towards the right, and the rate of the reaction is practically the same as that of the fixation of HCN by the Na₂S₂, so that finally the same result is obtained as though all the S of the polysulfide was converted into thiocyanate. When the washing soln. is completely decolorized, it is removed and distd. It contains Na₂CO₃, (NH₄)₂CO₃, (NH₄)₂CNS, (NH₄)₂S, and a little (NH₄)₂S₂O₃. (NH₄)₂CO₃ and (NH₄)₂S are decomposed and volatilized and Na₂CO₃ decomposes the other NH₄ salts. If Na₂S₂ soln. was originally used there is just enough Na₂CO₃ formed completely to decompose all the NH₄ salts; while with a higher sulfide a certain amt. of Na₂CO₃ (which must be detd. by analysis) must be added before distg. The NaCNS soln. is evapd. to dryness, pulverized, mixed with Fe powder, and heated out of contact with air (preferably electrically) at 450°. The Na₂Fe(CN)₆ is extd. and transformed into K₂Fe(CN)₆ by known methods. The merits of this process are briefly outlined. Also in *Am. Gas. J.* 115, 386-8(1921).

A. P.-C.

Varieties of tar. MAX PÖPEL. *Chem. Ztg.* 45, 580-1(1921).—P. remarks on the confusion introduced by the increased number of designations for tars of various origins. The low-temp. tar (A) obtained from generators at a temp. not exceeding 600° may readily be distinguished from coke-oven tar (B) or lignite tar (C). On lab. distn. A leaves no pitch, but a small amt. of a resin-like residue, while B leaves large quantities of pitch. A is much higher than B in phenols. A is higher than C in paraffins, but lower in non-viscous oils.

DONALD W. MACARDLE

Low-temperature tar from a Bohemian lignite. M. DOLCH. *Petroleum Z.* 17, 77-9(1921).—The object of the investigation was to see whether this tar was worth working up by the methods used in the oil industry. Two samples were taken; one from the coal from a stratum, the other from a small vein of coal. Both were tested by heating a small mass of coal in a horizontal tube, thereby excluding practically all possibility of overheating, which was proved by the presence of paraffin and phenolic compds. The tar was sepd. by F. Fischer's method into volatile and non-volatile components and the volatile oils were decomposed into alkali-sol. compds., volatile bases and neutral oils. Analysis of the product is: alkali-sol. part volatile with steam 0.6%, bases volatile with steam 0.2%, neutral oil 12.5%, alkali-sol. part not volatile with steam 7%, non-volatile bases 0.8%, crude paraffin 19%, crude viscous oils 56%, asphalt 2%, loss 1.9%.

R. L. SIBLEY

The fermentation of cellulose (FOWLER, JOSHI) 16. Determination of sulfur in "Gasmasse" (FLEISCHER) 7. Treating wastes from water-gas plant (POLLOCK) 14. The acid amide fraction of nitrogen of peat (MILLER, ROBINSON) 15. Explosion hazards and its prevention (SHADGEN) 24. The control of furnaces (FRION) 13. The effect of coal on concrete (ANON) 20. Air pollution and wastefulness (DANNERTH) 13. Fuel requirements of steel mills (LEAHY) 9.

Motor-fuel. J. P. FOSTER. U. S. 1,384,946, July 19. A liquid fuel adapted for use in internal-combustion engines is formed of alc. 63, ether 34, kerosene 2 and aniline 1 part.

Fuel from peat. S. C. DAVIDSON. U. S. 1,384,012, July 5. Wet peat as obtained from the bog is stirred into a putty-like consistency, mixed with powdered pitch and powdered dry peat to form a homogeneous mass and the mixt. is pressed into blocks.

Coal briquets. SUEKICHI NAGATA. Japan 36,893, Aug. 9, 1920. Satd. CaCl_2 soln., 700 kg., is boiled with 300 kg. pitch to a homogeneous sticky paste. Powdered coal, coke or sawdust is added, heated under agitation and the product is made to a definite form.

Carbonizing wood, coal or similar materials. J. F. WELLS. U. S. 1,383,888, July 5. A vertical chamber is charged with wood, peat, lignite, coal or other similar material and combustion of gases or volatile products at the bottom of the charge is effected by admitting air below a grate. Carbonized material is withdrawn from the bottom of the chamber as the last of the volatile material is being consumed; and the withdrawn material is replaced by descending fuel from which volatile matter has been driven off by heat rising from the bottom of the chamber. Cf. C. A. 15, 432.

Gas from solid fuel. E. DOLENSKY. U. S. 1,384,453, July 12. A column of solid fuel such as coal and coke is subjected to a blow period in which the lower portion only of the column is blown with air and to an alternating run period in which steam passes upward through the lower portion; air is added to the water gas thus formed and the mixt. is passed through the upper portion of the column.

Carbureted gas from coal. C. W. BORTFORD. U. S. 1,385,167, July 19. Ignited bituminous coal or similar fuel is blasted with air in a generator, the blast thus generated is burned to complete combustion with O in carbureting chambers and when the latter are sufficiently heated their O supply is shut off. The generator fuel is then blasted until it is sufficiently hot for gas-making purposes, the blast gas being led to a holder. Thereafter the generator blast is shut off and steam is injected into the fuel bed for the purpose of steam distg. substances from the fuel and making water gas. The latter is carbureted and is led to the holder containing the recovered blast gas and mixed with the latter.

Gas-producer. J. WELLS. U. S. 1,385,291, July 19. The pat. relates to control of the fuel supply which is fed from a fuel compartment superposed upon the producer chamber.

22—PETROLEUM, ASPHALT AND WOOD PRODUCTS

F. M. ROGERS

The crude oils of Borneo. J. KRYWLEY. *J. Inst. Petroleum Tech.* 7, 209-33(1921).—See C. A. 15, 1615. The author's name was misspelled in the former abstract.

E. J. C.

Petroleum as the foundation of a chemical industry in Poland. ANON. *Petroleum Z.* 17, 822-3(1921).—A study of the possibilities of establishing in Poland an industry

for the production of aromatic hydrocarbons for the development of branches of a chem. industry and for the production of explosives by the pyrogenation of crude oils from Galacia similar to the methods formerly used in Russia on oils from Baku. From 100 kg. of petroleum can be obtained about 45% gas, 5-6% of C_6H_6 washed from the gas and 8% coke. From the tar and likewise from the C_6H_6 obtained from the gas, based on 100 parts oil, there are obtained 6-8% C_6H_6 , 3-4% C_6H_5 , 1-2% $C_6H_4(CH_3)_2$, and about 3% naphthalene and about 0.5% anthracene. Thus from 100 parts oil, one obtains from 10-20 times as much pure C_6H_6 and $C_6H_5CH_3$ as from 100 parts of anthracite coal.

R. L. SIBLEY

Preparation of a petroleum from a vegetable oil. A. MAILHE. *Compt. rend.* 173, 358-9(1921).—By passing vapors of linseed oil over heated balls of Cu mixed with MgO , Al_2O_3 , or kaolin at 550-600°, gaseous and liquid products were formed, the latter having a brown color, strong odor, and acid reaction. The distn. fraction of the product between 70-150°, after washing with $NaOH$, was a light yellow liquid, evolving much heat with H_2SO_4 , and giving a colorless inflammable liquid when hydrogenated over Ni at 180°. Fractionation of this liquid gave no sharp maxima, and the fractions showed ds. much higher than those of the C_6H_6 series with corresponding b. ps. Thus, the 100-5° fraction had d_{20}^1 0.7655, against d_{20}^1 0.6840 for C_6H_6 . Nitration gave more than 50% of nitro derivs., including $PhNO_2$ and $2,4-C_6H_4Me(NO_2)_2$. The portion which resisted nitration had d_{20}^1 0.7274, with an odor like the cyclohexanes. Passage over Ni at 350° gave H_2 and C_6H_6 , which was removed by nitration, the residue having d_{20}^1 0.7040, approaching that of C_6H_6 . *m*-Xylene was found in the hydrogenated fraction, b. 135-45°. Other portions of the original product gave similar results. Both naphtha, d. 0.7607, and burning oil, d. 0.8644, can therefore be prep'd. from a vegetable oil. The products are sol. in $EtOH$ in all proportions.

M. R. SCHMIDT

A study of refining petroleum and its derivatives with special reference to the Comodoro Rivadavia oil fields of Argentina. R. REICHERT. *Anales soc. quim. Argentina* 8, 415-26(1920).—A general discussion of oil refining methods. The Rivadavia crudes are very low in light fractions and high in asphalt, making the selection of a suitable (from an economic standpoint) method of refining difficult.

L. E. GILSON

Tetrahydronaphthalene. A new engine fuel. J. B. RATHBUN. *Petroleum Age* 8, No. 9, 76(1921).—Tetrahydronaphthalene has a sp. gr. of 0.9751, is water-clear and b. 205°. The f. p. is -30°, thus comparing favorably with that of C_6H_6 . The flash point is 78°, which makes this liquid an especially desirable fuel for high-compression types of internal-combustion engines. There is also less tendency toward preignition and knocking. The heating value of 11,600 cal. per kg. together with a high permissible compression means a greater output from a cylinder of given size than is possible with either gasoline or benzene. A mixt. of 1 part by wt. of tetrahydronaphthalene with an equal amt. by wt. of gasoline or benzene, gives an excellent fuel for engines. In addition, the tetrahydronaphthalene exerts a great solvent action on incrustations, resinifications and the like, which occur within the cylinder of the internal-combustion engine. There is also a much smaller C deposit than is the case with other fuels in use.

R. L. SIBLEY

Mazout. F. LAUR. *J. pétrole* 21, No. 6, 2-4(1921).—Mazout is defined as crude petroleum from which has been sepd. petroleum ether, gasoline, kerosene, and gas oil. On this basis, the amts. of mazout present in various oils are as follows: Penna. oil 20%, California oil 78%, Texas oil 92%, Mexican oil 93%, Russian 56%, Roumanian 42%, Galician 55%, Java 33% or an av. of 50% for all countries.

R. L. SIBLEY

Balkash "sapropelite." L. LITINSKY. *Petroleum Z.* 17, 437-40(1921).—The air-dry sapropelite exhibits an elastic, blackish green mass and in thin strata is glistening yellow. It evolves a heavy H_2S odor and turns yellow in the air. According to Salesski,

this sapropelite consists of a conglomerate of oil-contg. or rather oil-producing algae (*Botryococcus Brauni*) without any cementing material. The characteristic physical properties of this material, such as elasticity, viscosity, burning with a heavy sooty golden-yellow flame with simultaneous partial melting together accompanied with frothing and a peculiar odor which does not resemble a petroleum odor, etc., suggested names such as fossil gum, rubber substance, elaterite, etc. The content of this substance in oil is so high that it flows from the ground and is carried on the surface of the H_2O where, because of the loss of H_2S , influence of the air, and the loss of a part of the moisture, it changes from a dark green to a yellow-brown thick viscous mass which could be cut with a knife and is deposited on the shore of the lake. The content of the dried specimen is 90% org. material which on analysis shows 73.76% C, 10.9% H, 1.03% S, 0.56% N, trace P, 13.74% O. The extn. is best made with Et_2O , CS_2 and CCl_4 . The extd. mass is a mixt. of hard, paraffin hydrocarbons, hard org. acids and a wax-like substance. By means of CCl_4 , 39% of the sapropelite was extd. and by a subsequent extn. with Et_2O , an additional 3.1% was obtained. A total of 42.1% was therefore extractable in the form of extd. org. product. The dry distn. of raw sapropelite gave 7-8% of light benzine hydrocarbons of b. p. up to 150°, and 26% of a heavier fraction which corresponded in its properties to kerosene (b. p. 150-200°). The benzine boiled at 70-125° and was stable. After keeping for 5 years, in an open flask, no change of color was noticeable. The refined benzine b. 58-150°, d_{10} 0.726, and n_D^{10} 1.4120. The petroleum fraction is colorless and also stable, d_{10} 0.794, and corresponds to kerosene obtained from petroleum of d. 0.979 to 0.830. Further products of dry distn. of sapropelite were 8-9% of a heavy oil, b. 200-340°, which consisted chiefly of hard paraffin hydrocarbons, coke and gases. The gases evolved suffice for carrying out the distn.

R. L. SIBLEY

Oil-shale industry in Russia. L. LITINSKY. *Petroleum Z.* **17**, 368-71 (1921).—A general description of several of the shale deposits of Russia. R. L. SIBLEY

The investigation of a bituminous shale. M. DOLCH. *Petroleum Z.* **15**, 881-4 (1920); cf. *C. A.* **15**, 316.—The shale is an amorphous rather soft stone which is a dirty yellow to dark brown. It occurs in layer formation and has a sp. gr. 0.748, which confirms the conclusion that there are larger masses of org. substances in the shale. The shale burns with a bright flame while the unburned residue evolves an odor of burned paraffin. The shale can be mined without the use of explosives. An analysis of the shale gave: moisture 3.4, ash 21.6, coke 13 (crude coke 34.6), volatile substance 62.1% (pure coal 75.1%). The crude coke gave: ash 61.5, org. matter 17.3%, heating value (volatile matter) 840 B. t. u. per kg., distn. yield 31.5-34.9%, N from 0.11 to 2.2%. These results would probably be changed in operation as it is then practically impossible to prevent overheating. Hence the yields possible in large-scale manuf. can be better estd. from distns. carried on by carbonizing large quantities. If overheating occurs, the escaping gas is satd. with light hydrocarbons, which can be sep'd. by washing with tar oil. An investigation of the compn. and calorific value of gas liberated from a g. of shale gave the following: volatile hydrocarbons 13.1 CO_2 and H_2S 5, heavy hydrocarbons 15.7, CO 11.8, CH_4 21, H 31.4, N 2.0%. The calorific value of the gas was 6260 heat units. After sep'n. of the volatile and heavy hydrocarbons, the gas consisted of CO_2 7.0, CO 16.6, CH_4 29.5, H 44.0, and N 2.8%, while its heating value was about 4000 heat units. The yield of oil by the dry distn. method of Strache and Dolch was 33%. The residue had a content of 32% combustible substance, which can be regarded as fixed C. The av. yield of oil on distn. of the shale was 42% of the wt. of the shale and would be higher with better condensation. The av. combustible residue was 30%. The tar was worked up by F. Fischer's method to det. the value of the tar especially as regards its paraffin and lubricating oil content with the following

results: neutral oil 27.1, bases 0.9, creosote 11.5, paraffin 9.9, viscous crude oil 50.0%.

R. L. SIBLEY

Studies in Colorado shale oils. ARTHUR J. FRANKS. *Chem. Met. Eng.* 25, 49-53 (1921); cf. *C. A.* 15, 2179.—The modified $\text{HNO}_3\text{-Br}$ method of Waters for detg. S in petroleum was found to be inaccurate, but excellent results were obtained in a Parr bomb with Na_2O_2 . N was detd. by a slightly modified Kjeldahl-Gunning method. S was detd. in 5 samples of Colorado shale oils and in their several 10% fractions, the range in the crude oils being 0.61-0.77% S. S was greatest in the 20-30% fractions, and rather const. in the middle fractions, while the total loss of S during distn. was about 33% of the S in the crude. At least 3 different classes of S compds. are thought to be present, 2 of them being quite stable. N was detd. in 3 samples and their fractions, ranging from 1.501-1.855% in the crudes. N increases rapidly in the higher fractions, while 40% is lost in distn., showing that one of the classes of nitrogenous compds. present is very unstable.

M. R. SCHMIDT

Laboratory study of Colorado shales. R. D. GEORGE. *Railroad Red Book* 38, 734-8 (1921).—From expts. with a small pot mercury retort connected with a steam superheating device on one side and a water-cooled condensing coil and a series of receivers on the other, it was concluded that the most favorable range of temps. for retorting Colorado shale is between 280 and 340° and the best temp. is about 320°. Crude oils obtained within this range of temp. yielded an av. of 33.7% straight run gasoline (up to 460°) and 20.7% kerosene (cut at 600° F.). The gasoline fraction averaged 54% satd. hydrocarbons, while the kerosene fraction averaged 44.2% satd. A gasoline scrubber placed beyond the NH₃ scrubber removed 6.4 gals. gasoline per ton shale treated. With superheated steam in retorting, the yield of crude is higher, the yield of NH₃ is nearly double, the satd. content of gasoline is higher (averaging 63.3%) the kerosene yield is larger but the gasoline yield is smaller while the gasoline yield in the scrubber was 9.3 gals. per ton. A test run, in which the temp. was raised to over 600° after all the oil possible was taken off at 410°, increased the NH₃ yield from 19.5 to 25.2 lbs. per ton and converted the fixed C almost entirely into gases. The spent shale was a pale ash-gray and showed no tendency to cohere in masses.

R. L. SIBLEY

Production of pine oils in the forest of Bialowies. AUGUST PARST. *Naturw. Z. Forst- u. Landw.* 17, 105-37 (1919); *Balan. Abstracts* 5, 183.—This is a description of a plant for obtaining the various oils and distn. products from pine. T. G. PHILLIPS

Combustible material from paraffin by catalysis. MAILHE. *Tech. Rev.* 8, No. 2, 38 (1921); *Petroleum Z.* 17, 265 (1921).—M. points out the great advantage gained by treating petroleum by catalysis according to Sabatier's method. Hydrocarbons corresponding to ordinary illuminating oil can also be split off. A gas results which contains 15,500 cal. and consists of H and gaseous hydrocarbons. By condensation, a liquid is obtained which by fractional distn. yields 50% of constituents boiling below 160°. Practically a complete splitting-off of light products and permanent gases results. The gas obtained in this manner can be used to enrich water gas and coke-oven gas and for the autogenous welding and cutting in place of C₂H₂; it is also readily compressed.

R. L. SIBLEY

Commercial ceresins. F. KIRCHDORFER. *Seifensieder Ztg.* 48, 317, 385-6, 384-5, 409-10, 457, 481, 508, 528-9 (1921).—A general treatise contg. nothing new. P. E. E.

The briquetting of charcoal. A. F. JOSEPH AND B. W. WHITFIELD. *J. Soc. Chem. Ind.* 40, 190-2T (1921).—Charcoal prep'd. from a number of Sudan woods was briquetted with gum, starch, millet flour (dura) and wood tar. Starch is a better binder than gum. The densest and strongest briquets were made with wood tar.

E. G. R. ARDAGH

Petroleum of Argentina and Bolivia (ANDERSON) 8. Detection of very small quantities of beeswax in admixture with mineral oil (JOLLES) 7. Further tests on concrete oil-storage tanks (ANON.) 20. Transformer oil sludge (RODMAN) 4. Low-temperature tar from a Bohemian lignite (DOLCH) 21.

Reclaiming sludge acid in petroleum refining. W. H. SIMONSON and O. MANTIUS. U. S. 1,384,978, July 19. Sludge acid from petroleum refining is concd. by heating to about 132-143° under less than atm. pressure, to vaporize the H_2O .

Distilling ocotillo. S. M. DARLING. U. S. 1,384,939, July 19. In distg. ocotillo or similar materials, with production of a carbonized residue, the gases and vapors given off by the distn. are passed through a condenser and the uncondensed gases are returned from the condenser to the hottest portion of the mass undergoing distn. in order to economize fuel. Paraffin oils also may be cracked in the hottest zone to obtain aromatic oils as condensates.

Furnace for distillation of oil-shale or similar materials. J. N. WINGETT. U. S. 1,384,878, July 19. The furnace comprises superposed vaporizing and combustion chambers alternately arranged, linings for the chambers, outer shells around them, and horizontal plates lying between the top and bottom walls of adjacent chambers, extending between the outer shells of adjacent chambers and spacing the shells from the linings to provide insulating spaces.

Emulsifying oil or asphalt. D. J. McSWINEY. U. S. 1,384,805, July 19. In emulsifying oils or asphalt, an emulsifying material such as a soap soln. is passed through a container and there is gradually added to it the substance to be emulsified in such regulated amt. as not at any time to exceed 4 times the amt. of emulsifying material. The process is repeated to incorporate more oil or asphalt.

Apparatus for treating sawdust. YASOKICHI MITSAYA. Japan 30,912, Aug. 11, 1920. By means of the heat generated by burning wet sawdust, dry dust is subjected to dry distn., resulting in the production of powdered charcoal, $AcOH$, $MeOH$, Me_2O , etc.

23—CELLULOSE AND PAPER

A. D. LITTLE

Cellulose ethers and esters. CLARENCE E. LEHMANN. *Chem. Age* (N. Y.) 29, 343-5(1921).—The history is given and industrial uses of acetylated celluloses are discussed. The field of mixed ether-esters is practically untouched. These compds. apparently possess wide industrial applications.

C. J. WEST

Are hydrocelluloses uniform substances? H. OST and R. BRETSCHNEIDER. *Z. angew. Chem.* 34, Aufsatzeil, 422-3(1921).—Hydrocellulose, prep'd. according to Girard, is dissolved to the extent of 24% when boiled with 1% $Ca(OH)_2$ for 12 hrs., while 16% of cotton for nitration is dissolved. The Cu no. of the fresh hydrocellulose (6.69) decreased to 0.91 during the 12 hrs. boiling, while the cellulose no. varied from 0.14 to 0.30. With cellulose the changes were: Cu no. 2.05 to 0.61; cellulose no. 2.30 to 0.36, the change in the cellulose no. taking place during the 1st 0.5 hr. boiling. The viscosity of the 2 products in NH_4OH -CuO was: hydrocellulose, after 24 hrs., 2.36, after 7 days, 2.10, which did not change materially upon boiling; cellulose, after 24 hrs., 5.83, after 7 days, 3.03, which decreased after 12 hrs. boiling to 4.52 and 2.34. The study of the acetylation products of the 2 compds., together with the viscosities, indicates clearly that the residue remaining after boiling hydrocellulose with $Ca(OH)_2$ is not cellulose, but is essentially the same as the uncooked hydrocellulose. Therefore hydrocellulose is a uniform decompn. product of cellulose, with a smaller mol. There

is still needed an answer to the question why the solv. of hydrocellulose in $\text{Ca}(\text{OH})_2$ decreases upon continued boiling.

C. J. WEST

Saccharification of cellulose. A. WOHL AND H. KRULL. *Cellulosechemie* 2, 1-7(1921).—In lab. expts. cellulose yielded 97% of the theoretical amt. of reducing sugars by a preliminary liquefaction with fuming HCl, followed by saccharification by boiling with dil. acid. The material was moistened with 3 parts H_2O , cooled with ice and satd. with HCl gas. After 5 hrs. at 20°, the acid was removed by evapn. *in vacuo* at temps. up to 70°. The residue was dissolved in H_2O to make approx. 10%, containing 1% HCl and boiled for 8 hrs. The sugar was detd. by cupric reduction. Results indicate that the method might be used for the *detn. of cellulose*. 100 g. dry pine shavings gave 60.9 g. of apparent dextrose, from which 18 g. EtOH were obtained by fermentation. This yield of EtOH is only about 60% of the theoretical, while the reducing sugars obtained from pure cellulose gave EtOH equiv. to 90% of the theoretical. Probably the hydrolysis of the cellulose in the wood is impeded by incrusting substances, and also, if the action of the HCl is prolonged to 24 hrs., non-fermentable reversion products are formed in relatively large quantity. All attempts to improve the process by a preliminary treatment to dissolve the lignin were unsuccessful. The yield of reducing substances was increased by the use of Cl, but the yield of LiOH was diminished. An 18% yield of EtOH from pine wood, however, would entitle the process to serious consideration if only the difficulties associated with the evapn. of HCl on a large scale could be overcome.

C. J. WEST

Splitting off of furfural, alkali solubility and reduction capacity of oxycelluloses. CARL G. SCHWALBE AND ERNST BECKER. *Zellstoff u. Papier* 1, 100-103, 135-9(1921).—Four samples of oxycellulose and 3 samples of hydrocellulose were examined as to their behavior towards alkali, $\text{Ba}(\text{OH})_2$, $\text{Ba}(\text{OH})_2$ adsorption, acidity and reduction capacity as well as yield of furfural. The yield of furfural is not a characteristic property of oxycelluloses, and there are marked differences in their alkali resistance, copper number and acidity. The values obtained indicate 2 classes of oxycelluloses, those in which the acid character is predominant, and those in which the aldehyde character is prominent. A comparison of the two products seems to indicate that the acid character is almost completely lacking in the hydrocelluloses. Denitrated wood pulp and denitrated nitro-silk (Chardonnet silk) have the character (as shown by chem. behavior) of the oxycelluloses and the hydrocelluloses, respectively. C. J. WEST

Acetolytic decomposition products of cellulose. R. PROSEGEL. *Paper* 28, No. 7, 86-98, 234(1921).—See *C. A.* 15, 945. H. H. HARRISON

Composition of reeds (*Phragmites communis*, Trin.). F. HERIG. *Cellulosechemie* 2, 25-34(1921).—The cellulose content was detd. by the Cl method of Cross and Bevan, for which an improved form of app. is described. Pentosans were detd. by Tollen's furfural method, moisture was detd. by drying at 105°, ash by carbonization with NH_4NO_2 , and lignin by difference. In different samples of air-dried reeds the stems (57-61%), sheaths (16.5%) and leaves (26-22%) contained: cellulose, 38.64-40.98, 24.96-31.06, 21.45-21.35%; pentosan, 17.27-19.86, 15.75-17.59, 15.21-10.52%; lignin, 32.42-30.38, 37.42-35.25, 42.01-50.79%; ash, 2.20-2.00, 14.00-8.00, 11.33-10.67; moisture, 9.47-7.00, 7.87-8.00, 10.00-6.67%. C. J. WEST

Sulfite cellulose. A. KLEIN. *Paper* 27, No. 16, 20, 32; No. 17, 20, 34(1920).—See *C. A.* 15, 435. H. H. HARRISON

Wood-pulp investigations. F. SENZE, B. PLEUS AND J. MÜLLER. *Paper* 28, No. 10, 27-9, 40-1(1921).—See *C. A.* 15, 1620. H. H. HARRISON

Prospects of wood-pulp production in Chile. U. S. BUREAU OF FOREIGN AND DOMESTIC COMMERCE. *Paper Maker and Brit. Paper Trade J.* 62, No. 3, 372(1921).—Olivillo produced 38% of unbleached pulp 2.15 mm. in length. This pulp was dark in

color and would make a good wrapping paper. Laurel has too short a fiber length to be valuable. Coigne produced 42% of 0.86-mm. pulp. Lingne gave a pulp 1.11 mm. in length. Roble pulp was too dark to have any commercial value. An annual reed quilla, which occurs in large quantities, when pulped gave a fiber of 2.22 mm. Aranacan pine and canelo also gave satisfactory results. H. H. HARRISON

Wood and wood-pulp infection and decay. OTTO KRESS. *Pulp and Paper Mag. Can.* 18, 1225-9 (1920).—Pulpwood should be peeled as soon as possible and stored in yards well drained and free from weeds. Some 70 odd organisms have been isolated from infected pulps and any antiseptic used must prevent growth of all of these. The effects on ground wood pulp of decay are a decided decrease in fiber length, a much darker color, a 10% lower yield, reduced strength of the paper made, difficulties in machine operation, foaming, larger size requirements, and dirt. Sulfite pulp may become infected but soda, sulfate and rag pulps are not affected. In the cooking of infected woods it has been found that the decrease in the amount of alpha cellulose and the increase of beta cellulose is indicative of the extent to which decay has progressed. H. H. HARRISON

Relation of moisture contents of wood to its decay. WALTER H. SNELL. *Paper* 28, No. 9, 22-4 (1921).—Moisture contents between 25 and 42% are most favorable to decay of pulpwood. As spraying of wood piles gives 52 to 60% moisture it should afford ample protection. H. H. HARRISON

Spraying wood for preservation and fire prevention. E. SUTERMEISTER. *Paper* 27, No. 16, 21, 30 (1920).—A log pile was sprayed with water in order to keep the moisture content of the wood high enough to prevent decay. The results showed that the moisture content of the pile was not uniform but that decay was prevented. The chips from wood stored in this manner contain from 52-60% moisture. H. H. HARRISON

A study in the preservation of pulp and pulpwood. FOREST PRODUCTS LABORATORY. *Paper* 28, No. 20, 20-3 (1921).—The preservative action of 106 chemicals has been studied; the results favor NaF. Borax, boric acid, sodium dinitrophenolate, $Na_2Cr_2O_7$, Na_2CO_3 and $NaHCO_3$ follow in the order named. In applying chemicals at the wet machine 60% is lost, applying at the press roll 70% is retained when a 5% soln. is used. H. H. H.

Shortening cooking time of sulfite pulp by preliminary impregnation. VANCE P. EDWARDS. *Paper Trade J.* 72, No. 16, 207-15 (1921); *Paper* 28, No. 7, 80-5, 234 (1921); *Paper Industry* 1921, 313-23.—Woods can be pulped successfully in appreciably shorter times and at lower temps. by the use of preliminary impregnation. Both yield and pulp quality are improved, though color and ease of bleaching are not entirely satisfactory. The acid compn. must be modified to take care of the increased speed of the chemical reaction. Increased yields, decreased screenings and stronger pulp accompany the use of higher combined SO_2 . H. H. HARRISON

Sulfite liquors. MAX GRÖGER. Vienna. *Z. angew. Chem.* 34, Aufsatzteil, 383 (1921).—G. points out that in the method of Schwarz and Müller-Clemm (*C. A.* 15, 3206 the calcn. of the analysis is based upon the supposition that the $Ca(HSO_3)_2$ and H_2SO_3 are present in mol. proportions. At any other ratio, the calcn. is incorrect. If a represents the cc. of N I soln. for oxidation and b the cc. of N NaOH for neutralization of the oxidized soln., then $0.03204 a$ represents the total SO_2 , $0.03204 (4a-2b)$, the bound and $0.03204 (2b-3a)$, the free. C. J. WEST

Method for differentiating and estimating unbleached sulfite and sulfate pulps in paper. R. E. LORION AND M. F. MERRITT. Bur. of Standards, *Tech. Papers* 189, 18 pp. (1921).—See *C. A.* 15, 1213. C. J. WEST

Paper from Australian hardwoods. NEW SOUTH WALES FORESTRY COMMISSION. *Paper-Maker and Brit. Paper Trade J.* 62, No. 3, 341 (1921).—Mountain ash, blackbutt,

spotted gum, mountain gum, karri and silky oak were pulped experimentally. Silky oak and mountain ash were the most favorable, producing very strong papers without blending with longer-fibered stuff.

H. H. HARRISON

Bamboos and sorghums as paper-making materials. C. GROUD. *Papier* 24, 341-4(1921); cf. *C. A.* 15, 751.—Outline of the distribution of many of the varieties of bamboos and of their resp. paper-making qualities, and also of sorghum (*Andropogon halopensis*) (Johnson grass).

A. P.-C.

Testing of paper. F. A. CURTIS. *Bur. Standards, Circ.* 107, 37pp.(1921).—Under the 3 classes, physical, chem. and microscopical, the various standard methods are given in detail with photographs of app. employed. No attempt is made to interpret results of tests. It is brought out that changes of temp. and humidity affect the phys. qualities of paper and for this reason a const. temp. and humidity room has been installed. It has not been possible as yet to give the relation between humidity and temp. changes and the physical characteristics of paper. Methods for sizing materials are given in detail. Suggestions are made as to the value of photomicrographs for studying the characteristics of various fibers.

C. J. WEST

Manufacture of coated paper. WM. T. SCHENCK. *Paper* 28, No. 18, 13-4(1921).—A description. The tendency is to eliminate very high gloss papers in favor of dull coated papers.

H. H. HARRISON

Chemical control of the process for de-inking paper. C. M. JOYCE. Leominster, Mass. *Chem. Met. Eng.* 25, 242(1921).—It is highly desirable to loosen the ink before subjecting the stock to any pulping process which imbeds the ink in the fiber in such a way that its removal is impossible. The mildest chem. treatment should be used, accomplished by using a min. amt. of soda ash and a temp. somewhat less than boiling. The form of app. used is less important than the careful chem. control of the process. Also in *Paper Industry* 3, 838-9(1921).

C. J. WEST

Waterproofing of paper. E. JENTZSCH. *Deut. Farber-Ztg.* 57, 587-8(1921).—The paper is twice passed through a bath of Al formate 3° to 5° Bé. then well dried. In place of the usual soap bath with paraffin added, the goods are put through a lime bath of 50 to 75 g. per liter at a temp. of 45° to 50°. Two passages are given on the foulard with care to have no folds or wrinkles in the goods before calendering.

L. W. RIGGS

Utilization for paper pulp of Phragmites communis. TRIN HERIG. *Paper* 28, No. 1, 22-5, 36, No. 2, 26-9, No. 3, 23-6(1921).—See *C. A.* 15, 946. H. H. HARRISON

Sulfate pulp and kraft paper. CLINTON K. TEXTOR. *Paper Trade J.* 73, No. 4, 46-54, No. 6, 46-54, No. 7, 54-60(1921).—A reading list.

H. H. HARRISON

Study of test methods for the purpose of developing standard specifications for paper bags for cement and lime. PAUL L. HOUSTON. *Bur. of Standards, Tech. Papers* 187, 19 pp.(1921).—See *C. A.* 14, 3319 (author's name incorrectly given as Houslan).

C. J. WEST

Characteristics of cigaret papers. LOUIS SCHWEITZER. *Paper* 27, No. 27, 14, 36(1921).—Cigaret papers are made from linen rags, hemp and flax. Ramic is the best but is too expensive. The rate of combustion of the paper is controlled by the quantity of filler present, the fillers used being CaCO_3 , MgCO_3 and craie de Medon, a mixt. of the two chalks. Papers which have been nitrated to increase combustibility give a crackling spitfire effect on burning.

H. H. HARRISON

Cotton linters for paper making. H. A. LINDBERG. *Paper* 27, No. 27, 20, 36(1921).—Linters are being used extensively in roofing felt and fiber board as well as in bond paper mills.

H. H. HARRISON

Glariumeter—an instrument for measuring gloss of paper. L. R. INGERSOLL. *J. Optical Soc. America* 5, 213-7(1921); cf. *C. A.* 9, 1690.—A new optical system for the earlier instrument is described. The gloss may be expressed directly in terms of the

% of polarization or in terms of the readings of the circle in ordinary degrees, which may be preferable. Ordinary magazine paper shows from 25° to 40°. C. J. WEST

The principle of the Elmendorf paper tester. ARMIN ELMENDORF. *Paper* 28, No. 23, 15-7(1921).—A mathematical discussion of the working principle of the new tearing tester. H. H. HARRISON

Paper-mill operations. NELSON R. DAVIS. *Paper* 28, No. 18, 12-3(1921).—A brief general description of methods of mill control. H. H. HARRISON

The Warkaus mills of Finland. SULHO SETALA. *Paper* 28, No. 23, 11-4(1921).—A description. H. H. HARRISON

Rosin sizing. FRANO. *Mon. papeterie française* 52, 443-4, 481-2, 505-7, 541(1921).—A review of the theories of Würster and Sembritszki on the mechanism of sizing and of their application in the paper mill. A. P.-C.

Lignin and humin substances (JONAS) 11D. Lignin from rye straw (BECKMANN, ET AL.). 10.

KORSCHILGEN, J. P. AND SELLEGER, E. L.: *Technik und Praxis der Papierfabrikation*. Vol. I. Die Roh und Halbstoffe der Papierfabrikation mit Ausnahme des Holzzellstoffes. Berlin: Verlag von Otto Elsner. Verlagsgesellschaft m. b. H. bound M 75. For review see *Papier Ztg.* 46, 3466(1921).

Cellulose acetate solution. G. W. GOERNER. U. S. 1,384,188, July 12. Methylene chloride is used as a solvent of cellulose acetate together with EtOH or MeOH.

Recovering values from waste sulfite liquor. R. W. STREHLENERT. U. S. 1,384-219, July 12. Waste sulfite liquor is concd. and decomposed by heating under pressure in order to decompose ligno sulfates and ligno sulfites.

Paper from rush-mat. MASUNOSUKE ISHIGE. Japan 37,033, Aug. 30, 1920. Leaves of rush-mat are heaped up with rice-bran and warm water is frequently sprinkled on the heaps to promote fermentation. After 24 hrs. the leaves are rolled, immersed in lime water for several hrs., crushed, washed, boiled with 5% NaOH soln. for 30-60 min., washed with water and bleached. They are suitable for paper manuf.

Colored paper. L. P. WINCHENBAUGH and L. GRNTLE. U. S. 1,384,290, July 12. A paper web varying in thickness at different portions is treated on one side with a penetrative coloring liquid such as a soln. of an aniline dye in alc. or gasoline in such amts. as to strike through the thin portions of the paper.

Glazed paper. SEIJIRÔ ÔI. Japan 36,926, Aug. 11, 1920. Addition to 31,769. Two mixts., (1) 0.36 l. H₂O, 18.8 g. gelatin (or 20 g. casein), 18.8 g. Marseilles soap and (2) 0.18 l. H₂O, 3.8 g. Pb(OAc)₂ and 26.3 g. alum, are prep'd. by heating. They are cooled, mixed together and heated under agitation. When the soln. became viscous, a mixt. of BaSO₄, clay, talc and pigment is added and the product is painted on paper at 40° and rolled, water proof glazed paper being produced.

Mountain leather plate. SHIMAKICHI SEKI, KÔJIRÔ KOSHIGA and JIRÔ KOSHIGA. Japan 37,006, Aug. 28, 1920. Mountain leather (or fossil paper, mainly composed of Al or Mg silicate and produced in Manchuria and Mongolia) is immersed in a mixt. of 20° Bé. HCl and 60 times its wt. of water to eliminate Fe, then in *aqua regia* dill. with 5-10 parts of water or a mixt. of HCl (d. 1.163) and 8 parts water for 1 hr. to remove the magnesia, etc., between the fibers, washed with water, sep'd. into thin slices and made into thick paper by the usual method. It is a better *insulator* for heat and electricity than asbestos plate.

Waterproof insulating paper. SHIMAKICHI SEKI, KÔJIRÔ KOSHIGA and JIRÔ

KOSHICA. Japan 37,007, Aug. 28, 1920. Mountain leather (cf. preceding patent) is immersed in dil. HCl to eliminate Fe, washed, sepd. into thin slices, beaten in a beater and made into paper by the usual method. Resin soap, etc., is used as sizing material.

24—EXPLOSIVES AND EXPLOSIONS

CHARLES E. MUNROS

Liquid oxygen as a commercial explosive. Ch. LORMAND. (Fr.) Dept. of Agr. *Chimie & industrie* 6, 141-8 (1921).—A general description of the method and advantages of the use of liquid O as an explosive in mines and quarries, based largely on the results of Rice (*C. A.* 14, 2264). It is used in several quarries in the neighborhood of Paris, where various tests were carried out. By Trauzl's test, which consists in exploding a given quantity in a Pb block and measuring the increase in vol. of the cavity, the following results were obtained, with air having varying contents of O: 35%, no explosion; 40%, 9 cc.; 50%, 80 cc.; 55%, 147 cc.; 98%, 384 cc. A nitroglycerin dynamite gave 321 cc., showing an increase of 20% in favor of the liquid-O explosive. Comparative tests with Bichel's manometer showed that a pressure of 40 kg. per sq. cm. required the use of 115, 103, 96, and 86 g. of air contg. 50, 60, 70, and 80% of O, resp. The last figure, *viz.*, 87 g., is the same as for a gelatin dynamite. Practical tests carried out in the Lorraine coal mines showed that 1 kg. of dynamite produced 10 t. of coal and 1 kg. of liquid O explosive 15 t., the former costing 1.40 M and the latter 1.25. Similar results were obtained in gypsum quarries. No CO was detected in the products of combustion of liquid-O explosives by the method of Ogier and Kohn-Abrest (*C. A.* 2, 2662).

A. P.-C.

TNB and TNT. M. KOSTFVITCH. *Pamphlet* 1919, 38 pp., London.—This is the English edition of a report from the Chem. Lab. of the Michael Military Academy, St. Petersburg dated Mar. 25, 1914. It presents the results of an investigation of the nitration of C_7H_8 following Saposhnikov's theory of nitration mixts. presented in triple coordinate diagrams (*Z. ges Schiess-Sprengstoff* 1906, 453) as applied by Patara (Patart(*t*)) in the nitration of C_6H_6 (*C. A.* 9, 1900-1); a study by this method of the data from the literature for the nitration of C_6H_6 ; and an investigation of the nature of the tarry matter in spent TNT acids with a view to their further utilization. A detailed plan of the nitration system employed is given. It consists of an Al nitration vessel with all the operations electrically controlled at a distance and means for not only controlling and recording automatically temps. and times but the pressure, rate of rotation of the stirrer, the quantity of reacting materials and the rate at which they are brought in contact. In discussing his ternary graph for the nitration of C_7H_8 K. defines the areas of the formation of MNTs, of DNTs, of mixts. of these, of tar formation, and of "no nitration" and he points out that though nitration has been carried out on an extended manufg. scale there is as yet a large part of this field remaining unexplored even by the German dye chemists. The investigation of the tarry matters showed them to be quite insensitive to explosion and, by their presence, to render TNT less sensitive. Their menace in a TNT shell was in the fact that when the shell was in storage, through an increase in temp., the tar might rise and surround the detonator so as to make the shell a "dud." This tar was shown to possess as high as, if not a higher degree of chem. stability than TNT. From the tar K. isolated a TNT which he named δ -TNT. Besides triangular graphs recording the data of various expts. there are presented 12 photomicrographs of various DNT and TNT isomers as crystd. from various solvents together with many data on m. ps., b. ps., explosion temps. and other consts. C. E. M.

Absorption of moisture by colloided smokeless powder. TENNEY L. DAVIS.

Army Ordnance 2, 9-12(1921).—Though *double base powders* (nitrocellulose-nitroglycerin), as used by the British, if made without a solvent, show little or no tendency to take up moisture from a damp atm. and require no particular protection from moisture at the Proving Ground or the front, *single base powders* of nitrocellulose only, or *straight nitrocellulose powders*, do and as a consequence deteriorate so in their ballistic qualities that very carefully made and rather expensive containers were required for them and if these were torn in transit or the container was opened on a rainy day and the charge was not immediately used it had to be discarded because it could not be relied upon to fulfil the conditions of barrage fire. This absorption of moisture was found due not only to the hygroscopicity of nitrocellulose itself but also to the portion of Et_2O + alc. solvent retained in the grain. U. S. pyrocellulose powder is less hygroscopic than other straight nitrocellulose powders made from mixts. of sol. and insol. nitrocellulose. Exposure of straight N. C. powders to a moisture-saturated atm. and subsequent drying developed cracks or pores in the grains through which solvent was removed until by repetition, all was taken out. It is hoped that through the use of various colloidizing agents incorporated within the mass or applied to the surface of the grains a propellant may be obtained which, while possessing the many advantages of the present U. S. S. P., will be entirely indifferent to moisture. The following indicate what may be accomplished. Hygroscopicity of pyrocellulose 2.75; do + 10% cryst. DNT 1.93; do + 10% cryst. DNX, 2.09; do + 10% DNX oil, 1.99.

CHARLES E. MUNROE

Heats of combustion and formation of nitro compounds. I. Benzene, toluene, phenol and methylaniline series. W. E. GARNER AND C. L. ABERNETHY. *Proc. Roy. Soc.* 99A, 213-35(1921).—Study of the explosive properties of org. nitro compds. is incomplete without a knowledge of their heats of formation, for these consts. are closely related to the stability and sensitiveness to impact and heat of explosive substances, while they form the basis of calcs. of the energy liberated in detonation. The heats of detonation of balanced explosives, such as a mixt. of NH_4NO_3 and TNT arranged for complete combustion, can readily be ascertained from the heats of formation. But when there is insufficient O present the calcn. becomes more difficult, especially as the compn. of the products depends on the external work done by the gases, though, from a knowledge of the consts. of gaseous and heterogeneous equilibria, it is often possible to obtain values with some degree of accuracy. In this investigation the combustions were made in a Berthelot-Mahler-Krocker bomb with a special insulation, only such wt. being taken as would give a temp. rise of not more than 2° , and a correction for the heat of formation of the HNO_3 produced was applied with the other corrections. It was found dangerous to burn more than 0.5 g. of tetryl in the bomb. The nitro compds. were all purified to const. m. p. or b. p. and the data for the consts. thus found are presented as well as the heats of formation, combustion, crystn., nitration and heat of entry of the nitro-group both in tabular form and graphically. As the heats of crystn. for β - and γ -TNT were found to be 5.0 and 5.4 cal./mol., resp., as against Tamman's value of 4.88 for the α -compd., the large differences observed in the heats of combustion in the different TNT isomers cannot be accounted for by this characteristic. The heats of formation of the nitro compds. investigated are markedly influenced by the position of the nitro groups, but there appears no regular change in these values similar to that observed in the introduction of the CH_3 group into aliphatic compds. No empirical equation could be devized showing the relationships of the heats of formation for all aromatic nitro compds., but certain regularities appear to exist between the heats of formation and nitration. The heats of combustion in all of the series investigated decrease with increase in the number of nitro groups. The heats of formation tend to a max. for the second or third member of the series, and then diminish. The $\text{C}_6\text{H}_5\text{NO}_2$ series is an exception, but it is probable that the max. is shifted to the fourth

member of the series, and that the same general relationship would hold if the more highly nitrated compds. could be obtained. In the C_7H_8 series there is some regularity in the heats of formation of the di- and tri-nitro derivs., and an expression is given which takes into account the lowering of this const. by nitro groups, ortho to CH_3 , and to one another. The introduction of the CH_3 group into C_6H_6 modifies only slightly the shape of the curves showing the heat of formation of the nitro compds., but the introduction of a HO - or CH_3NH group has a marked effect. The resemblance between the curves for the C_6H_5OH and $C_6H_5NHCH_3$ series is striking; the effect of the HO on the energy changes involved in nitration is thus very similar to that of the CH_3NH group, a result scarcely to be expected. The heats-of-nitration curves for these substances are straight lines. On the other hand, there is no simple additive relation for the entry of nitro groups into the C_6H_6 and C_7H_8 series. The differences between these and the C_6H_5OH and $C_6H_5NHCH_3$ is apparently connected with the relative ease of nitration of these substances; the nitration of the former, especially to the highly nitrated members, takes place with difficulty, whereas the latter are easily nitrated. In this connection also it may be mentioned that it is possible to nitrate C_6H_5OII to the tetranitro deriv., and $C_6H_5NHCH_3$ to the tetrani trophenylmethylnitramine and pentanitrophenylmethylnitramine, while only the trinitro derivs. of C_6H_6 and C_6H_5OH have been obtained. From this study of the nitro compds. of the C_6H_6 , C_7H_8 and C_6H_5OH series, it is clear that the nearer the nitro groups are to one another in the C_6H_6 ring the greater is the strain in the mol. and the lower the heat of formation. The *o*-mononitro compds. of these series have the smallest heat of formation. The differences between the *o*- and *p*-derivs. are, however, greatest for C_6H_6 and least for the C_6H_5OH series. In the case of di- and tri-nitro derivs. also, the proximity of the groups has the same effect. The sensitiveness of nitro compds. to impact and their comparative instability run in line with their heats of formation; thus β -TNT, which has the lowest heat of formation, is the most sensitive to impact. The stability of the unsymmetrical TNT's and tri-nitrobenzenes is less than that of the sym. forms. Certain conclusions can now be made with regard to the part played by the heat of formation in detg. the magnitude of the heat of detonation of a high explosive. The large heat of formation of the nitrophenols is a disadvantage from the point of view of their employment as explosives, though this is to some extent balanced by their comparatively high O content. Thus, although TNT contains 29% less of the O necessary for complete combustion than does picric acid, yet its heat of detonation is similar, namely, 924 cal., compared with 914 cal., per g. (water gaseous). This is to be expected from the lower heat of formation of the TNT (128 cal. as compared with 277 cal. per g. for picric acid). In this example the introduction of the HO group into C_6H_6 is accompanied by the absorption of more energy than that of the CH_3 group to form C_6H_5 and this is reflected in the explosive phenomena. The figures available show the fifth member of a series, *i. e.*, a tetrani tro compd., to have a very low heat of formation. The effectiveness of tetryl as an explosive is very largely dependent on its being the fifth member of the $C_6H_5NHCH_3$ series and thus possessing a low heat of formation. The entry of the fourth nitro group into the side-chain does not affect this uniformity. Of the isomeric TNT's, β -TNT has the lowest heat of formation. If on detonation these 2 substances gave the same products of decompr., β -TNT would have an advantage over α -TNT of 54 cal. per g. For the same reason, the unsymmetrical trinitrobenzene should be a more powerful explosive than the sym. compd. In general, the greater the number of adjacent groups in a mol. of a high explosive, the greater will be the heat of detonation, but there are often practical limitations to this choice on account of the greater reactivity and lower stability of the less sym. nitro compds.

CHARLES E. MUNROE

Recovery of waste nitrating acids. CARL MARX. *Chem. Age* (N. Y.) 29, 251-5

(1921).—Deals with the sources, denitration, fortification and utilization of spent acids from the nitration of cellulose, starch and aromatic compds. and the concn., clarification and purification of the HNO_3 and H_2SO_4 contd. therein. Much of the information is derived from letters patent and publications of British Ministry of Munitions.

CHARLES E. MUNROE

Precautions for prevention of dust explosions. ENG. & INSPECTION DIV. TRAVELERS INSURANCE CO. *Chem. Age* (N. Y.) 29, 289-90 (1921).—The formation of dust should be reduced to the minimum, complete cleanliness observed, all sources of ignition eliminated, substances which might cause sparks should be removed from stock before it goes into the machine, and the machinery be grounded to prevent accumulation of static charges. CS_2 vapor is believed to have been the initiating cause in some of the worst dust explosions that have occurred and its use in grain elevators should be supervised by some responsible person vested with authority to take every precaution.

CHARLES E. MUNROE

Use of explosives in blasting stumps. GEORGE R. BOYD. U. S. Dept. of Agr., *Dept. Circular* 191, 15pp. (1921).—This is a contribution to the campaign of the Bureau of Public Roads in the distribution of the surplus picric acid, from the military supplies, to farmers throughout this country for land-clearing purposes, and, with the aid of illustrations, it gives in a simple manner detailed instructions as to the methods of using explosives for this purpose and the precautions to be taken to ensure the security of the users and others and of adjacent property.

CHARLES E. MUNROE

Storing carbide with explosives. CHARLES E. MUNROE. Bur. of Mines, *Repts. of Investigations* Sept. 1921, mimeographed, 3 pp.—On the investigation of the explosion of some 9000 lbs. of dynamite in a mine magazine it was developed that 2 drums of CaC_2 had been stored in the magazine; that not long prior to the explosion the night watchman had entered the magazine and filled his canister with carbide; and that rain was falling at about that time. The characteristics of CaC_2 and C_2H_2 are described and the objections to storing CaC_2 with explosives set forth.

CHARLES E. MUNROE

Coal-mine explosions. JAMES W. PAUL. *Proc. Eng. Soc. Western Penn.* 37, 69-86 (1921).—Deals with occurrence of mine explosions; gas and dust as factors; source of ignition; propagation and velocities of coal-mine explosions; the shock, explosion and detonation waves; air movements; character of dusts forming explosive mixts.; prevention and control of explosions through use of inert material, rock dust and dust barriers, and observance of other well known precautions enumerated by P. The results of tests and demonstrations of mine explosions carried out at the Bureau of Mines Experimental Mine at Bruceton, Pa., are described.

CHARLES E. MUNROE

The use of inert gas for the prevention of explosions. EDWARD F. WHITE. *Chem. Met. Eng.* 25, 513-15 (1921).—The efficiency of admixed inert matter in restricting or preventing explosions is well known. W. finds that the complete combustion of coke in a specially designed generator gives a mixt. of CO_2 and N which may be effectively employed in many industrial operations to prevent explosions. A specially designed generator for producing this gas from coke is described with illustrations and the results of tests on S-laden atm. are given. With coke at \$20 per ton the cost of scrubbed gas in the holder is estd. at about 8 c. per 1000 cu. ft.

CHARLES E. MUNROE

Electrical apparatus for testing high explosives and smokeless powder. M. KUSTEVITCH. *Pamphlet* 6 pp., 2 pts. Sidmouth, Devon, Eng., July 25, 1919.—This is a portable elec. device for testing the stability of smokeless powder at definite temps. and all other powders and explosives yielding gaseous emanations that will affect litmus paper, according to the principle embodied in the Vieille test. In addition to being portable this device is provided with a standardized color scale, reflecting mirrors, and a prismatic binocular eyepiece by which a comparison of the litmus paper and standard

ized color scale may be made at any time and at any fixed temp. while both are within the enclosure, and several tests may be carried on simultaneously. A novel feature is providing a chart having a color scale and associated temp. scale for each separate explosive and particularly for each "mark" or factory lot. As this testing app. may be used on board ship or near storage magazines it becomes easily possible to maintain a const. supervision over any lot of explosives in transport or storage or, in case of an emergency, to make the examn. on the spot instead of being obliged to send samples to a distant testing lab. under all the necessary difficulties attendant on the transportation of explosives.

CHARLES E. MUNROE

Explosions hazard and its prevention. JOSEPH F. SHADGEN. *Iron Age* 108, 127-30, 205-6, 239-40(1921).—This is a thoughtful review of the literature on explosive mixts. of solids, liquids and gases, the characteristics of fuels being analyzed with special reference to powdered-coal installations and the means for prevention of explosions. Numerous tables, photographs of flame propagation and graphs are given. C. E. M.

Artificial leather from cordite (ANON.) 29. Transformation of explosives into fertilizers (LISSONG) 15. Accidents in factories and workshops (ANON.) 13. The production of picric acid from grass tree gum (JEWELL) 10.

Explosive. R. L. HILL and A. J. STRANE. U. S. reissue 15,155, July 19. See original patent No. 1,307,495, *C. A.* 13, 2281.

Explosive. C. A. WOODBURY. U. S. 1,382,260, June 21. Bursting charges for shells, torpedoes or the like are formed by mixing picric acid and NH₄ picrate with molten TNT and pouring the material into its container while the ingredients are in a state of soln. and suspension.

Explosive. W. O. SNELLING. U. S. 1,382,563, June 21. An explosive adapted for use as a "booster" charge is formed of nitrostarch desensitized by heavy mineral oil and mixed with paraffin or similar waxy material, together with nitrates, chlorates or perchlorates.

Explosives. A. SEGAY. Can. 182,244, Feb. 12, 1918. An explosive, which may be satisfactorily compressed, has 66 pts. of an O-carrier, 7 of an explosive which may be detonated and 27 of an alk.-earth silicide.

Detonating composition. R. M. COOK and B. CROTTA. U. S. 1,385,245, July 19. A mixt. of Ph azide 40-95 and trinitrophenylmethylnitroamine 60-5 parts is used for charging blasting caps. The explosion temp. of the mixt. is about 250° or lower.

Incendiary composition. W. T. SCHEELE. U. S. 1,382,804, June 28. An incendiary mixt. adapted for use in bombs or shells is formed of (CH₂)₆N₄ 33 $\frac{1}{4}$ and Na₂O₂ 66 $\frac{3}{4}$ %. U. S. 1,382,805 relates to a mixt. for the same purpose, formed of (CH₂)₆N₄ 25, Na₂O₂ 50 and paraffin 25%. U. S. 1,382,806 covers a similar mixt. in which cylinder oil or a similar oil is used instead of paraffin. U. S. 1,382,807 covers an explosive mixt. comprising (CH₂)₆N₄ 22.5 and Na₂O₂ 77.5%.

Ammonium perchlorate explosive. O. B. CARLSON. Can. 186,277, Aug. 27, 1918. An NH₄ClO₄ explosive, which contains up to 1% of a chlorate of K, Na, Ba, or Ca, is more sensitive to shock.

Pulverizing explosives. J. H. HUNTER. U. S. 1,382,287, June 21. Propellant explosives such as perforated nitrocellulose smokeless powders are pulverized and the products of different degrees of pulverization are sepd. to obtain a finely divided detonating material.

Pyrotechnic composition. C. E. BIVINS. U. S. 1,384,424, July 12. A compn. which may be readily molded is formed from "red gum" 20, naval pitch 5-20, trinitrophenol 1-5 and HNO₃ 20-25 parts.

25—DYES AND TEXTILE CHEMISTRY

L. A. OLNEY

Influence of the degree of dispersion of the dyestuff in the indigo vat on the shade produced. M. FREIBERGER. *Textilber.* 2, 84-6(1921).—The color of a fabric dyed with indigo is due to indigo deposited within the fiber, this being greyish blue in color and very fast to rubbing; to a cellulose-dyestuff compd. of indigo-blue color, fast to rubbing; to cryst. indigo deposited near the surface of the fiber, violet-blue in color and less fast to soap and rubbing; and to re-oxidized indigo attached to the surface of the fiber, bluish grey in color and not fast to soap and rubbing. The degree of dispersion of the indigo in the vat dets. the condition in which it dyes the fiber. Fast dyeings result when the indigo is in a highly dispersed state, and this is obtained by increasing the temp. and diln. of the dye liquor. Fugitive dyeings result when the dye liquor contains indigo in a highly aggregated state, due, e. g., to the presence of an excess of lime or glue or an insufficiency of NaOH. The Na salt of indigo white forms a colloidal soln. of a higher degree of dispersion and enters the fiber more freely than the Ca salt, and it also serves as a carrier of re-oxidized indigo.

J. S. C. I.

Aniline black dyeing. J. SCHMIDT. *Textilber.* 2, 105-6(1921).—The loss of strength of fabrics dyed with aniline black under the most favorable conditions is 5-15%. When "aniline salt" is used in the padding liquor, the free mineral acid which it contains is neutralized with aniline oil, and acetic, formic, or lactic acid is added; 30 pts. of NaClO₂ is required to oxidize 100 pts. of aniline salt. Attempts to replace NaClO₂ by perborates or peroxides were unsuccessful because the resulting mixts. were unstable. Cu salts used as catalysts help to tender the fabric. The strength of the fabric is unaffected by the addition of 1-2% of acetic, formic, or lactic acid to the padding liquor, but tartaric acid produces tendering. The presence of alk.-earth salts of acetic and formic acids in the padding liquor preserves the fabric, since a metallic hydroxide is formed within the fibers. MgCl₂ (30 cc. of a 6% soln. per 1000 cc. of padding liquor) is a suitable hygroscopic substance. The ageing chamber should be well ventilated so as to remove acid vapors; the temp. should not exceed 30-5° R. (38-44° C.) and the atm. contained therein should be 50% satd. with moisture. After chroming, the fabric should be soured, washed twice, and soaped.

J. S. C. I.

Dichromates and wool dyeing. I. WINTHROP C. DURFEE. *Am. Dyestuff Rep.* 9, No. 10, Tech. Sect. 20-3(1921).—The history of the use of dichromates in dyeing is given. Although dichromates are at present the best material for mordanting, careful control must be exercised in their use on wool, or in combination with org. dyestuffs on account of their strong oxidizing action. Thus if there is 40 times as much water as wool in the bath, 3% chrome to the wt. of wool would be a diln. of 1 in 1300. But if the chrome is all absorbed into the fiber it will be concd. to 1 in 33. This is quite concd. for so energetic a chemical and it generally takes place at boiling temp. which increases its activity. Under these conditions the S in the wool may be oxidized to sulfates and the wool tendered. Shoddy or reworked wool, because of its previous treatments, is far more sensitive to the tendering action of chromates than new wool. A 3% chrome may be used for mordanting or to fix a color, and a 5% chrome is used as a stripping agent to destroy color. Scientific chem. control is necessary at every stage of the process in which chromates are used.

L. W. RIGGS

Historical sketch and observations on development of Franklin dyeing. W. W. WARDEN. *Am. Dyestuff Rep.* 9, No. 10, Tech. Sect. 26-33(1921).—The feature of this process is the Franklin Tube invented and patented by Daniels. This tube is made of a helical spring, compressible in the direction of its length, covered with a knit cover on which the yarn to be dyed is wound. The parallel tube winder of the Universal

Winding Company is used for winding. A round closed tub or vat contg. a number of upright perforated tubes receives the tubes of yarn over the perforated tubes, and the dye bath is forced through the yarn in both directions, the app. being controlled by a 4-way valve. The advantages over the older methods are uniformity of dyeing, employment of unskilled labor since a person can learn to run the machine in a few hrs., comfortable working conditions as practically no steam escapes from the vats, and a small amt. of steam required to run the machines. L. W. RIGGS

Correct water for dyeing and textile purposes. A. T. SMITH. *Am. Dyestuff Rep.* 9, No. 10, Tech. Sect. 23-6(1921).—The ideal water for textile purposes should approach distd. water as nearly as possible. The effluent of an efficient filter plant can be neutral water, sparkling and clear, provided a scientific examn. of the raw water has been made and the treatment and filtering app. designed in accordance with the findings. Fe and Mn salts may require oxidation before pptn. and filtration. Water softeners are discussed at length with emphasis upon the modern successful zeolite softeners in which Ca and Mg compds. are displaced by those of Na. L. W. RIGGS

Perborates. JUSTUS HARTSTEIN. *Deut. Farber-Ztg.* 57, 731-2(1921).—The use of perborates for the production of O in washing, bleaching, dyeing and finishing is discussed and its advantages are emphasized. L. W. RIGGS

Battick printing. L. KOLLMANN. *Textilber.* 1, 149-51(1920).—The influence of the previous prepn. of cloth for battick printing has been investigated. Mercerization affects not the nature but only the depth of shade of the ground and grain. Alk. treatment gives a clear vigorous grain. For "throwing up" wax reserves, gums and dextrins are satisfactory. Paraffin-coloophony wax reserves are best printed at 75-80° in order to obtain clear effects. In breaking, the reserve must be actually broken and not merely bent. Breaking is best conducted under cold water since reserves broken in air tend to re-unite and so render dyeing more difficult. Dyeing should quickly follow breaking. The mercerization of waxed fabrics allows special effects to be obtained. J. S. C. I.

Preliminary treatment of colored goods. W. KRIPPGANS. *Deut. Farber-Ztg.* 57, 533-4(1921).—The goods, usually clothing, should be carefully cleaned, sorted according to their colors and all Fe parts such as clasps or hooks removed. Treatments in baths of soda, Cl, etc., are described with much detail and many exceptions. L. W. RIGGS

Formation of stains on, and tendering of wool fabrics due to faulty carbonization. P. HEERMANN. *Textilber.* 2, 106-7(1921).—Large and small dark stains often found in colored woolen dress materials which have been carbonized are due to the use of too strong an acid or too high a temp. during carbonization. Where the material is stained, the wool is tender and under the microscope is shown to be completely destroyed. J. S. C. I.

Dyeing and finishing of staple fiber fabrics. A. WINTER. *Textilber.* 2, 40-1(1921).—Staple fiber fabrics (cf. *C. A.* 14, 633) contg. vegetable fibers only are prep'd. for dyeing by the usual methods except that bleaching is preferably carried out by immersing the fabric for 20-30 mins. at 20° in a 1 1/2% soln. of NaClO, lightly rinsing, immersing in HCl of 1° B. (sp. gr. 1.007), washing, and treating with an "antichlor." Fabrics contg. animal fibers are bleached with H₂O₂, Na₂O₂, or Na perborate solns., rinsed, and soured in formic acid. Dyeing may be carried out in the usual manner with direct, S, and vat dyestuffs. Fabrics used for clothing generally contain wool and are dyed by the usual methods for cotton-wool unions, very fast shades being obtained by dyeing the wool with chrome-mordant dyes and the cotton with S dyes, glue, glucose, or bisulfite being added to the dye-bath to preserve the wool from injury. Shot effects may be obtained. After dyeing, the wool is invariably treated with formic acid to restore its pleasing "handle." The finishing processes are dependent on the compn. of the fabric, but are similar to those usually adopted. 5-6% of Naphthylamine Black E&F

(Cassella) in the presence of 4-5% of sulfuric or formic acid gives a full shade on wool and a light grey on staple fiber, so that it is very useful in testing staple fiber fabrics for the presence of animal fibers.

J. S. C. I.

The weighting of piece silk. HELMUT ROSSBACH. *Deut. Farber-Zig.* 57, 586-7 (1921).—Silk is usually weighted by means of metallic salts or materials contg. tannin. The procedures for weighting silk with SnCl_2 , stannous phosphate, stannous phosphate and silicic acid, sumac, tannin or sugar are described.

L. W. RICCS

Chemical treatment of fibers to change their appearance. ANON. *L'Avenir textile* (March 1921); *Industrie chimique* 8, 326 (1921).—The natural appearance of cotton threads or fabrics can be altered by various treatments other than mercerization. A large number of processes for giving cotton the aspect of silk are described. On the whole they consist in treating the fibers successively with starch paste or an ammoniacal casein soln. and with 75% HNO_3 .

A. P.-C.

Chemical treatment of agave fibers. ANON. *L'Avenir textile* (April 1921); *Industrie chimique* 8, 325-6 (1921).—Owing to their roughness agave fibers can be used only for the manuf. of brushes, carpets, and cordage. By suitable treatment they can be rendered sufficiently supple for spinning into a fairly fine thread. They are first allowed to ferment in lukewarm water, pressed, immersed in a very thin milk of lime, removed, heated with H_2O under pressure, and finally treated with acid. The mineral acids give a rather dark color; to have a lighter colored fiber $\text{Na}_2\text{S}_2\text{O}_4$ is used.

A. P.-C.

Waterproofing textile fabrics with rubber. FREDERIC DANNERTH. *Textile World* 60, 1213-5, 1635 (1921).—General.

CHAS. E. MULLIN

Investigation of the principle of photochemistry (LASAREV) 3.

Disazo dye. A. J. FIELD. U. S. 1,383,710, July 5. A blue pigment color forming a dyestuff with dextrin is prep'd. by combining tetrazotized toluidine with 2-naphthol-6-sulfonic acid and 2-naphthol-8-sulfonic acid.

Monoazo dye. A. J. FIELD. U. S. 1,383,711, July 5. A water-sol. bluish red dye is formed by combining diazotized 2-naphthylamine-1-sulfonic acid with 1,8-aminonaphthol-3,6-disulfonic acid.

Dyeing moleskins. H. GABBE. U. S. 1,384,446, July 12. A compn. for dyeing moleskins is prep'd. from logwood dye 50, NH_4Cl 25, sumac 25, CuSO_4 25 and FeSO_4 25 parts. Sb oxide also may be added to give a darker shade.

Apparatus for coloring yara or thread. H. P. DENISON. U. S. 1,384,940, July 19.

Treating vegetable fiber to simulate wool. C. SCHWARTZ. U. S. 1,384,677, July 12.—Vegetable fibers are treated with concd. HNO_3 at ordinary temp. and then washed, to impart to them the character of wool, as to feel, appearance and calorific quality and as to some of their affinities toward dyes.

"Wool substitute" from cellulose. P. H. MINCK. U. S. 1,383,742, July 5. A "wool substitute" is formed by squirting a cellulose soln. through a nozzle into a pptg. bath, to form a thread and then removing chemicals from the thread by passing it horizontally through a dripping bath of H_2O or other liquid so that the falling drops of the liquid dripping bath serve to maintain the thread under a tension.

Fibers from the bark of the mulberry. TATSUJIRO YOSHIDA. Japan 36,713, July 5, 1920.—Fermentation of the bark is conducted in a closed vessel. The product is washed with H_2O , boiled with NaOH of 8° Bé during 6 hrs., washed, dried, immersed in 94% alc. for 24 hrs., sep'd. from alc. by pressing, treated with NaOH of 42° Bé contg. a small quantity of Turkey red oil, washed and dried at a low temp.

26—PAINTS, VARNISHES AND RESINS

A. H. SABIN

The fastness to light of artists' colors. HANS WAGNER. *Farben-Ztg.* 26, 2523-4 (1921).—W. objects to the popular expectation that all aniline colors should be permanent, points out that the user must select his paints for the purpose intended, and suggests a classification into (1) artists' colors which should be pre-eminently permanent, (2) student artists' colors, fairly permanent, and (3) school colors.

F. A. WERTZ

Prohibition of the use of white lead in the paint industry. ANON. *Farben-Ztg.* 26, 2526-7, 2594-5, 2654-6 (1921).—The reply of the Soc. of German Lead Pigment Mfgs. to the proposal of the International Workingmen's Conference. F. A. WERTZ

Investigation of the drying of linseed oil. HANS WOLFF. *Farben-Ztg.* 26, 2851 (1921).—W., like Eibner (*C. A.* 15, 1627, and following abstract), points out that the detn. of the usual "constants" of a linseed oil may indicate its purity, but its real quality as a normal oil should be detd. by physical tests. Pure linseed oil stored for 1.5 yrs. in an air-tight Zn container required 8 to 14 times as long to dry as the same oil stored in a glass bottle in the dark; although the oils showed practically the same consts.

F. A. WERTZ

Non-drying linseed oil. A. EIBNER. *Farben-Ztg.* 26, 2307-2403 (1921).—A pure linseed oil that will not dry in air does not exist, although oil from seed pressed in the dark and exposed in thin films in the dark required 66 days to dry, but showed a normal gain in wt. of 16%. The initial absorption of O by linseed oil is not dependent on light, but the drying of the oil through transformation of the peroxides appears to be. The eventual drying of the oil in complete darkness can probably be traced to the effect of light on the oil while still in the seed. E. reviews his work (*C. A.* 15, 1627) on the constitution of linseed oil, the effect of undercoat on the drying of subsequent coats, etc. The drying of linseed oil is a function of the source of seed, method of extn., age, light intensity, temp., humidity, and other general atm. influences. Results of expts. are plotted to show the effect on time of drying of these various influences; pressed oil dries better than extd. oil, especially that extd. with CCl_4 ; aged oils dry more rapidly. The usual detns. of hexabromide, acid, sapon., and I nos., unsaponifiable matter, etc. do not give a complete indication of the quality of an oil, and will not detect small admixtures of soy oil, etc. E., therefore, believes that they should always be supplemented by the detn. and study of the curve representing the gain in wt. on exposure; and examn. of the character, such as tackiness, drying, etc., of the film. Such curves for various mixts. of linseed oil and paracopaiba oil, and poppy-seed oil, are given. Linseed oil mixts. contg. up to 30% of these oils dry within relatively short times but the curves show the unsatisfactory drying process, and the films even after 10 yrs. become very tacky and stringy in warm weather, are almost completely sol. in ale., and become liquid at 100° ; while pure linoxyd simply chars at 260° , this shows that the admixtures prevent the formation of normal linoxyd. Other physical tests which should be applied to oils which are shown by the gain in wt. curve to be abnormal are effect of steam and H_2O on the film, tensile strength, behavior of the paint made from the oil with various pigments, etc. A test just developed which seems to detect all unsatisfactory linseed oil, whether on account of adulteration, or of slow drying of a pure oil due to its being freshly pressed, consists in detg. the m. p. of the thoroughly dried thin film. A pure linseed-oil film of satisfactory quality begins to color a yellowish brown at 160° , and slowly chars without sintering at 240 - 260° . Poppy-seed-oil films melt at 120 - 140° with foaming; a film of linseed oil contg. 5% of rosin sinters at 115° and at 130° foams

profusely. This method will even detect the turpentine residues remaining in a film produced by a soln. of linseed oil in turpentine. F. A. WERTZ

The testing of varnishes. I. A method for testing elasticity. HANS WOLFF. *Farben-Ztg.* 26, 2587-90(1921); cf. *C. A.* 15, 1818.—In testing varnishes for their ability to withstand bending, a sheet of tin plate is coated in the same manner (brush, spray, or dip) as the varnish is intended to be used. After drying, panels 1.5 by 8 cm. are cut from the large plate. The small panel is then placed across the hinged joint between two boards; one end is securely fastened and the other contains a slot through which a large-headed nail driven into the board allows movement when the boards are turned on the hinge. The hinge with the panel is moved through 10 to 15°, allowed to remain for 5 or 10 min., and the bend in the panel examp. with a lens, and the severity of the cracking or flaking noted. If the film does not crack even when the hinged plates are back to back, the bending process is repeated; about 20 min. are allowed for the film to adjust itself after each complete bend. The angle of bend or number of complete bends which are possible before cracks appear, is a measure of elasticity. Panels were coated with the same varnish by brushing, one, 3, and 6 coats; by dipping; and by spraying; and then subjected to the bending test. The consistency of the varnish was so adjusted during application that the final dry films contained the same quantity of varnish in each case. The greater number of thin coats were much more elastic than the thick single coat; the dipped coat was as elastic as the 3 brushed coats; and the sprayed coat as elastic as the 6 brushed coats. Tabulated results on the increase in elasticity of spirit varnishes by the addition of castor oil show that the greatest increase occurs between 0 and 1% oil. The method can be used for detg. increase of brittleness with age, and the effect of temp. on elasticity. F. A. WERTZ

Lacquer finishes on chandeliers. W. D. SCOTT. *Metal Ind.* 19, 363(1921).—Complete directions are given for giving brass and steel the following finishes, mercury gold, russet bronze, statuary bronze, Japanese bronze. C. H. ELDRIDGE

Japanning. W. A. DARRAH. *Brass World* 17, 213-7(1921).—Com. japs consist of linseed or other oxidizing oil, gums or pitches, drier, color and solvent. Uniform temp. and const. agitation are desirable. A japan should be weatherproof, somewhat flexible, sufficiently thick to be lasting, should have sufficient hardness to prevent excessive scratching, and take on a brilliant finish. Results are detd. by the compounding, the time and temp. of baking, the temp. gradient, the uniformity of temp., and the air condition in the oven. The japan and the metal surface should be warmer than the air to allow uniform polymerization of the oil and hardening of the gums. The primer coat is thicker than the later coats and carries most of the pigment. The batch type of oven is good for small plants, but the fuel economy is lower than in the continuous type. Three types of heaters are employed: gas, elec., and "air heated." In the latter type ventilating air and radiant heating means are both maintained at the desired temp. by combustion of oil or gas in a sep. oven composed of refractory materials serving as a fire box or combustion chamber. Above this is mounted a series of air heaters divided into 3 groups. The first group supplies preheated air for combustion of the fuel, the second and larger group heats the vol. of circulating air which passes through flues arranged longitudinally, along the sides of the oven and out. The heat is transferred at high temps. in the combustion furnace to the material which is lower in temp. Design should call for a max. of exposed radiating surface per unit vol. of useful oven space. Walls must be air-tight, and the structure light with due consideration of thermal expansion. W. H. BOYNTON

Artificial resins. ANON. *Oil, Paint and Drug Rep.* 100, No. 9, 25(1921).—A brief review of the general classification and uses of artificial resins such as aldehyde resins, methylene phenol, cumarone, ester gums, etc. F. A. WERTZ

The constituents of fir balsam (turpentine from *Pinus silvestris*). F. HENRICH. *Z. angew. Chem.* 34, Aufsatzeil, 363-7 (1921).—The white fir, *Pinus silvestris*, is the most abundant conifer in Germany and was the only source of turpentine during the war. The best tapping method consisted of cuts 1.5 cm. deep and wide, sloping downward from either direction to a central vertical cut from which the turpentine was collected in suitable vessels with minimum loss of volatile products. The crude balsam contained about 25% volatile constituents consisting principally of *d*- α -pinene of $[\alpha]_D^{20} +28.41^\circ$. Some of this turpentine spirit was hermetically sealed in glass and tests over a period of 4 yrs. showed no change in *d*. or $[\alpha]$. Exposure to air causes resinification and a loss in $[\alpha]$ but there is no evidence to support the suggestion that the non-volatile constituents of a crude turpentine are the products of oxidation and polymerization of pinene. Careful fractionation and examn. of the turpentine obtained at different seasons and from different sources showed no variations except that rosin from trees grown on rich soil showed lower ester values. All the fractions were practically pure α -pinene, but an especially pure product was produced by distn. over Na of a 157° fraction. From this pure pinene nitrosochloride, pinonic acid, semicarbazone, and oxime were produced. Higher boiling fractions of turpentine gave tests for β -pinene. Cf. *C. A.* 10, 2984.

F. A. WERTZ

Detection of very small quantities of beeswax in admixture with colophony (JOLLES)
7. Wall paints for sugar factories (MICKSCH) 28.

Paint vehicle. W. N. BLAKEMAN, JR. U. S. 1,385,033, July 19. A paint vehicle adapted for use with anhydrous pigments is formed of linseed, soy, cottonseed and tung oil or a similar fatty oil mixed with a mineral oil of the Texas oil type; *e. g.*, a hydrogenated asphaltic oil.

Paint. W. N. BLAKEMAN, JR. U. S. 1,385,034, July 19. Anhydrous pigments such as barytes and ZnO with $PbSO_4$ are mixed with Texas oil or similar mineral oil and fatty oils to form a paint adapted for resisting atm. influences.

Mineral oil mixture for use in paints. W. N. BLAKEMAN, JR. U. S. 1,385,035, July 19. A mixt. of tung oil with Texas oil or a similar mineral oil is used as a paint vehicle.

Paint oil mixture. W. N. BLAKEMAN, JR. U. S. 1,385,036, July 19. Oxidized Texas oil or similar oxidized mineral oil is used in prep. a paint vehicle, together with tung oil or other similar fatty oil.

Hydrogenated mineral oil in paints. W. N. BLAKEMAN, JR. U. S. 1,385,037, July 19. A mineral oil of the Texas type is hydrogenated and the hydrogenated product is used together with fatty oils in prep. paint vehicles.

Asphalt paint. SHINJI TADA. Japan 36,946, Aug. 16, 1920. Asphalt, 375 g., is dissolved in 9 l. benzine, purified by washing with H_2O , mixed with 37.5 g. bird-lime in 375 g. benzine and agitated.

Paint for ships' bottom. SHINGYÙ MATSUSHITA. Japan 36,878, July 31, 1920. The paint is made by letting kieselguhr absorb HgO or Cu compds. $HgCl_2$, 100 parts, in H_2O 350 is mixed with kieselguhr 320, boiled with 35 parts $NaOH$ and 500 parts H_2O , washed with H_2O and dried. Six parts of this mixt. are mixed with 3 chrome red, 10 shellac, 3 wood tar and 3 oil of turpentine. Cu_2O , prep'd. by boiling $CuSO_4$ with grape sugar and $NaOH$, may be used instead of $HgCl_2$.

Carbon pigment. E. SZARVASY. U. S. 1,383,674, July 5. See Brit. 158,889 (*C. A.* 15, 1974).

Preparing drying oils from hydrocarbons. H. A. GARDNER and E. BIELOUSS.

U. S., 1,384,447, July 12. Drying oils adapted for use in paints or varnishes are formed by chlorinating hydrocarbons such as a mineral oil and then dechlorinating the material by the action of superheated steam in the presence of a solvent for the chlorinated material, *e. g.*, kerosene, with or without metals or metal oxides to promote dechlorination.

Drying oil made from saturated hydrocarbons. E. BIELOUSS. U. S. 1,384,423, July 12. A drying oil adapted for use in paints is obtained by chlorinating petroleum oil until it contains 34% of combined Cl, then dechlorinating at a temp. of about 220-240° or lower without use of an active catalyst.

Solidifying chinewood oil. B. SCOTT. U. S. 1,383,864, July 5. Chinewood oil is thoroughly mixed with FeCl_3 , ZnCl_2 , AlCl_3 or similar halides previously ground in rosin oil or linseed oil to form a moldable mixt., which is seasoned by gentle heating. Cf. *C. A.* 15, 1082.

Polishing composition. C. ROSENTHAL. U. S. 1,383,427, July 5. A polish for varnished surfaces is formed of a wax 5 lbs., turpentine 10 lbs., gasoline 10 lbs., "banana oil" 4 lbs., "oil of mirbane" 12 oz. and alc. 4 oz.

Printing ink. H. A. BARMIR. U. S. 1,383,512, July 5. A printing ink is formed of gilsonite 70, fuel oil 120 and paraffin oil 12 parts.

Printing ink. TATSUZO SATO. Japan 37,198, Sept. 30, 1920. Potassium soap is gradually dissolved into satd. alum or $\text{Al}_2(\text{SO}_4)_3$ at 70° until the soin. has become neutral. The product is washed with H_2O and heated to 240-260°.

Increasing the "grease-setting" properties of rosin. F. M. ROGERS and C. P. MCNEIL. U. S. 1,381,504, June 14. The grease-setting properties of rosin are increased by digesting it for 24 hrs. at a temp. (preferably about 260°) sufficiently high to convert the abietic acid content of the rosin into grease-setting form but not so high as would cause distn. of the abietic acid.

27—FATS, FATTY OILS AND SOAPS

E. SCHERUBEL

Chemistry of the fat of *Equus caballus*. A. HEIDUSCHKA AND A. STEINRUCK. Dresden. *J. prakt. Chem.* 102, 241-68 (1921).—The fat tissue from various parts of the horse was rendered, yielding a golden-yellow soft fat of pleasant odor, m. 32.3°. After some weeks it sep'd. into solid and liquid layers. It had d_4 0.9224, d_{40} 0.9135, n_{D}^{20} 1.4617, acid no. 2.62, sapon. no. 203.95, R.-M. no. 0.417, Polenske no. 0.375, I no. 75.17, Hehner no. 95.45, acetyl no. 14.02, AcOH no. 6.93. The Baudouin test gave a brown color, HCl (d. 1.4) a dark brown, and the Wellmann test a siskin-green, changing to a dirty white with NH_4OH . Sapon. yielded mixed fatty acids corresponding to 95.16% of the fat. The solid mixed acids had I no. 77.25, sapon. no. 214.4, mean mol. wt. 261.7. The mixed acids were sep'd. according to Heiduschka and Felser (*C. A.* 14, 2097). The unsatd. acids (A) were 62.9% of the total acids and had I no. 116.16. Oxidation by KMnO_4 yielded a white solid, partly sol. in Et_2O . The sol. portion was a dihydroxystearic acid, rhombic prisms, m. 131.5°, sapon. no. 176.9, AcOH no. 110.0, acetyl no. 187.6. The insol. portion contained stearinic acid, sapon. no. 159.5. Bromination of A yielded 3 products, 2.66% of linolenic hexabromide, m. 177°; 12.13% of linoleic acid (B), m. 114°; and 85.17% of oleic acid (C). The satd. acids (D) were 37.1% of the total acids, m. 55.5-58°, mean mol. wt. 279.35. No arachic acid was present. D was sep'd. by the method of Heintz (*J. prakt. Chem.* 66 (1855)), of Fachini and Dorta (*C. A.* 6, 2551), of Partheil and Ferié, and of Hehner and Mitchell (Lewkowitsch, *Chem. Technol. Fette, Öle und Wachse*). It was found to be chiefly palmitic acid (E) and stearic acid (F) with traces of myristic acid, lauric acid and C. It was found in short

that (1) the liquid fat contained besides C, 73.4% of B and 1.61% of linolenic acid (G); (2) the quant. sepn. of fatty acids by the method of Varrctrapp was inaccurate, better results being obtained by pptn. of the Pb salts in Et₂O soln.; (3) the solid fat did not contain heptadecylic acid, but a mixt. of E and F; (4) the total fatty acids contained 1.69% of G, 6.68% of B, 55.24% of C, 6.82% of F, 29.47% of E and (5) 0.426% of unsapon. was found, chiefly cholesterol.

C. C. DAVIS

The development and importance of the beeswax industry in Switzerland. L. NEUBERGER. *Seifensieder-Ztg.* 48, 695-6 (1921). P. ESCHER

Some sources of non-drying oils. M. RINDL. *S. African J. Industries* 4, 641-9 (1921).—The following sources are discussed: *Balanites manghamii*, *Colodendron capensis* (cape chestnut), *Adansonia digitata* (Baobab tree), *Sclerocarya caffra* (Marula nuts), *Anacardium occidentale* (Cashew nuts), *Ximenia americana* (Zuurpruim), *Ximenia caffra* (Kaffir plum), *Telfairia pedata*. E. SCHERUBEL

South American oil seeds. G. T. BRAY AND H. T. ISLIP. *Analyst* 46, 325-7 (1921).—The results are given of the examin. of 4 oil seeds. *Theobroma grandiflorum* (cupu seeds) is found in the upper Amazon. The seed contains 8% H₂O and 48.7% fat of rather soft consistency, creamy white in color and resembling cacao butter. The consts. are: m. p. 32.0°, titer of fatty acids 48.1, d₁₅²⁰ 0.8522, sapon. no. 187.8, I no. 44.8, unsapon. matter 0.91%, n_D²⁰ 1.456, sol. volatile acids 0.08%, insol. volatile acids 0.12%. Compn. of the residual meal: H₂O 9.9, crude proteins 18.7, fat 7.0, carbohydrates 43.8, crude fiber 14.3, ash 6.3. *Hymenaea courbaril*. The oil extd. from the seeds with petroleum ether was nearly colorless and had an unpleasant odor. The consts. were not detd. The seeds contained: H₂O 11.5, oil 6.4%. The residual meal contained: H₂O 11.0, crude proteins 7.1, fat 7.0, carbohydrates 67.7, crude fiber 5.5, ash 1.7%. *Parinarium seeds*. The oil extd. with petroleum ether was dark brown, of unpleasant odor and on keeping became a soft semi-solid fat. The seeds of 2 species from S. America and Sierra Leone, resp., contained: H₂O, 3.4 and 8.7%, oil 74.2 and 58.3%. The consts. of the oils were, resp., as follows: titer of fatty acids 41.6 and 48.3°, d₁₅ 0.905, 0.969, sapon. no. 200.5, 192.3, I no. 77.3, 157.1, unsapon. matter, 0.76, 0.7%, sol. volatile acids 2.68, 0.2%, insol. volatile acids 0.52, 0.4%, n_D²⁰ 1.469. The meal analyzed as follows: H₂O 7.4 and 12.2%, crude proteins 24.7, 12.1%, fat 7.0, 7.0%, carbohydrates 46.6, 56.1%, crude fiber 8.2, 8.9%, ash 6.1, 3.7%. *Platonia* (N. O. *Guttiferae*). The oil extd. from these seeds was a dark brown solid fat of slight aromatic odor. The H₂O and fat in the seeds were, 3.2% and 75.0%, resp. The consts. of the fat were: m. p. 31.0°, titer of fatty acids 50.1, d₁₅²⁰ 0.8782, sapon. no. 199.5, I no. 77.8, unsapon. matter 3.63%, sol. volatile acids 0.13%, insol. volatile acids 0.37%, n_D²⁰ 1.460. The residual meal analyzed as follows: H₂O, 9.2 crude proteins 14.3, fat 7.0, carbohydrates 56.2, crude fiber 13.4, ash 9.9%. Cupu seeds are the only ones which can be considered promising from a com. point of view. E. SCHERUBEL

Chinese colza seed. ANON. *Bull. Imp. Inst.* 19, 75 (1921).—The seeds contain a glucoside which, after autolysis, yielded 0.4-0.6% of crotonyl isothiocyanate on steam distn. The yield of fixed oil varied from 40 to 50%. The oil had the general characteristics of rape oils. The seeds contd. 23-25% proteins. R. L. SMILEY

Hydrogenation of maize oil. F. REICHERT AND R. A. TRELLES. *Anales asoc. quim. Argentina* 9, 80-8 (1921).—The optimum temp. for hydrogenation was 210-230°. Impurities in the naphtha used for extg. the oil may destroy the activity of the catalyst. The catalytic actions of nickel and platinum were compared by bubbling hydrogen through the oil at ordinary pressure and detg. the I value at intervals. With the Ni catalyst the I value even after 4 hrs. did not fall below 44.5, but with Pt after 3 hrs. the I value fell to 21 and a product was obtained which solidified on cooling and m. 57°. L. E. GILSON

Hydrogenation of some marine animal oils. H. MARCELET. *Compt. rend.* 173, 104-7 (1921).—Eight samples of oil were hydrogenated for 8 hrs. with 1% of basic Ni carbonate at 250° and I no. and solidifying point detns. made hourly. At the end of 8 hrs. the results were as follows:

| Oils. | <i>Centro-</i> <i>scymnus</i> <i>coelolepis.</i> | <i>Hexan-</i> <i>chus</i> <i>griseus.</i> | <i>Globi-</i> <i>cephalus</i> <i>melas.</i> | Cod. | Herring. | Whale. | Seal. | "Couronne." |
|---------------------------|--|---|---|-------|----------|--------|-------|-------------|
| I no. before treatment | 206 | 91 | 13.5 | 178 | 137 | 161 | 149 | 135 |
| I no. after 8 hrs. hydro- | | | | | | | | |
| genation | 51.1 | 25.2 | 8.9 | 48.5 | 65.8 | 40.5 | 53.7 | 91.2 |
| Solidification | | | | | | | | |
| p. after 8 hrs. | 42.0° | 39.2° | 8.9° | 48.5° | 35.2° | 45.5° | 33.0° | liquid |

All of the oils lost their disagreeable odor in 1 hr. and the drop in I no. was also greatest during the first hr. If one calcs. the % lowering of the I no. when the oils begin to solidify at room temp. (20 to 25°) a rough concordance is noted as follows: *Centroscymnus coelolepis* 47, *Hexanchus griseus* 43, cod 52, whale 44, seal 50, "Couronne" 42. For the oils which remained liquid after the above had solidified M. calcd. the I no. at which they should solidify and found the following: "Couronne," with 40 and 50% lowering of I no., resp., the I no. should be 81 and 67.5. *Globicephalus melas* with 40 and 50% lowering, resp., the I no. should be 8.1 and 6.5. To verify these figures the hydrogenation was continued until these values were reached and it was found that they were in agreement with those calcd.

E. SCHERUBEL

Glycerol manufacture. VIII. Purification of weak glycerol lyes and crude glycerols that distil with difficulty. P. VÉRNEEK. *Seifenseife-Ztg.* 48, 541-2, 633-4, 677-8 (1921); cf. C. A. 15, 2738.—Only soap-kettle lyes and fermentation glycerols are considered. A. *Soap-kettle lyes.*—(a) Process of the Vereinigte Chem. Werke A. G. at Charlottenburg. The crude glycerol is converted into a fat by combining it with a fatty acid in the presence of some condensing agent (naphthalenesulfonic acid or H₂SO₄) at 105-110°, the resulting fat being sepd. and then twitchellized. (b) Some unsuccessful expts. are described in which non-distillable glycerol was dild. and purified with Al₂(SO₄)₃ and FeCl₃, resulting in a richer glycerol, which, however, could not be distd. B. (a) *Protol and fermentol.*—V. describes briefly the production of protol by fermentation of pure sugar in alk. soln. in the presence of much Na₂SO₃ by means of pure yeasts at moderate temp., resulting in a liquor of 2-3% glycerol, 1-2% EtOH and 1% acetaldehyde, acetic acid, etc., from which the volatile products are first distd. and the residual glycerol water is concd. but without sepg. any salts (to 25° Bé.) and cooled; during cooling most of the Na₂SO₃ crystallizes out, yielding a liquor of 18 to 14% glycerol with considerable acetates, thiosulfates, lactates, thiocyanates, sulfides, etc. This is treated with CaCl₂ and small amts. of milk of lime are added to neutralize the acid reaction which continually returns; it is finally treated with some Na₂CO₃. The filter-pressed liquor is dark and impure but can readily be distd., the distillate comparing favorably with dynamite glycerol from soap lyes, but contains up to 4% trimethylene glycol. About 40% of the original glycerol present in protol is lost during purification. On account of the difficulty of removing all of the Na₂SO₃ numerous modifications of this method, which was officially prescribed, have been tried with questionable success. (b) Other processes. The following German patents are briefly mentioned: 314,446 to K. Höfl, Berlin; 310,606 to Billwärder Seifen- und Glycerin Fabrik Walter Kraus und W. H. Hofmann, Hamburg; 303,805, 305,174 and 310,175 to Jonas of the Farbenfab. vorm. Fr. Bayer & Co. This last process converts the glycerol into solid lead glycerate

by means of yellow PbO . After filter-pressing the solid product is decompd. by boiling with 19 times its wt. of H_2O at 150° under pressure. The product is filter-pressed, the filtrate satd. with CO_2 to ppt. Pb , filter-pressed again and the filtrate coned., a pure glycerol being yielded directly, ready for distn. (c) Expts. with FeSO_4 , air and Cl . In order to prevent corrosion of the app. during distn. in method *a*, the following process is proposed (developed in the lab. but not yet tried out on a com. scale): FeSO_4 is added to the crude liquor as a catalyst and air is blown through until no more oxidation occurs (as detd. by titration with I soln.). To the hot soln. an excess of milk of lime is added and the whole filtered. The filtrate is treated in an acid-proof tower with Cl gas and the excess Cl is removed from the liquor by air blast. It is again ptd. with milk of lime, filtered, ptd. with Na_2CO_3 soln., acidified, boiled, neutralized with NaOH and finally coned.

P. EISCHER

Modern soap-powder manufacture. M. O. STEFFAN. *Seifensieder-Ztg.* **48**, 589-91, 612-4, 631-2 (1921), illus.—A discussion of soap powders with a detailed description of methods of mixing of the soap with soda ash and Na silicate in a special kneading machine and the grinding in special mills. Two tables are given showing the requisite amts. of fats, H_2O , 38°Bé , NaOH and soda ash to furnish 1000 kg. product, ranging from 40 to 5% fatty acid content— one table for powders without Na silicate, the other for powders contg. 4% to $7\frac{1}{2}\%$ silicate of 36°Bé . The descriptions of methods in which powders are produced in one continuous operation, are taken from the patent specifications which are listed.

P. EISCHER

Rosin in the soap industry and some observations on the methods of its determination. R. JUNGKUNZ. Basel. *Seifensieder-Ztg.* **48**, 563-5, 675-6 (1921).—A compilation of the literature on the use of rosin for soaps. It is concluded that rosin does not improve the cleansing power of soaps, being inferior in this respect but that its use in soaps is legitimate if such soaps are declared to contain rosin. Of the methods for detecting rosin in soaps preference is given the Liebermann-Storch reaction although cholesterol, linseed oil, S oils and others give a like reaction; in such cases the I_R and I no. of the "rosin" acids should be used as confirmative tests. The quant. methods of Twitchell, Holde and Marcusson, R. E. Devine, Fahrion, Leiste and Stiepel, Wolff and Schozle and Fortini are discussed and their shortcomings noted; none is accurate and the proposition of stating results in terms of rosin acids instead of rosin is upheld. A bibliography of 39 titles is given.

P. EISCHER

Rapid method for the determination of sodium chloride in soap. H. C. BENNET. *J. Ind. Eng. Chem.* **13**, 813 (1921).—Weigh 5.85 g. of the soap into a beaker contg. 150 cc. of hot H_2O . Dissolve and ppt. the soap and fillers with 25 cc. of a 20% soln. of $\text{Mg}(\text{NO}_3)_2$. Without cooling, titrate the unfiltered mixt. against 0.1 *N* AgNO_3 soln. using KCrO_4 as indicator. The appearance of a reddish brown color is the end-point.

E. SCHERUBEL

Further tests on concrete oil-storage tanks (ANON.) **20**. Vegetable oils for internal combustion engines (MATHOT) **21**. The precipitation of solid fatty acids with lead acetate (TWITCHELL) **10**. Emulsifying oil or asphalt (U. S. pat. 1,384,805) **22**.

Hydrogenating oils. A. A. WELLS. U. S. 1,383,887, July 5. In hydrogenating animal or vegetable oils a stream of H is passed from beneath into a body of the oil containing finely divided Ni and the oil is given a slow swirling motion through its entire body.

Recovering solvents from wool-grease. C. N. WILSON. U. S. 1,383,585, July 5. The naphtha or other solvent used to extract grease from wool is recovered by cooling the grease and wool and allowing them to stand until the congealed substances settle out. The solvent is then volatilized from the liquid.

Purification of chrysalis oil. YOSHIBUMI KUMA and MASAYOSHI ISHII. Japan 36,955. Aug. 20, 1920. Dark brown chrysalis oil, obtained by pressing dried chrysalis, is heated with 10% H_2SO_4 of 45° Bé at 100° for 30-60 min. in a closed vessel, washed with warm H_2O , slightly heated with 10% Japanese acid clay and filtered by pressing. Decolorization and deodorization are effected by passing Cl into the filtrate, washing with water and heating under reduced pressure to eliminate excess Cl. The product is once more treated with 10% H_2SO_4 of 30° Bé and 7% Japanese acid clay and filtered. It is suitable for soap manuf.

Deodorization and decolorization of oil and fat. MICHIO MATSUNAGA. Japan 36,939. Aug. 16, 1920. Addition to 35,928 (C. A. 15, 607). By heating at 500-800°, purified acetylene decomposes to C, H, benzene, styrene, naphthalene, biphenyl, etc. So the products obtained by passing acetylene through an Fe tube at about 750°, are passed into oil, such as fish oil, containing Ni as catalyst at 170-200° during 1.5-2 hrs. under agitation. After the treatment has been completed, volatile substances are driven off by passing air or steam. The resulting colorless and odorless oil has a much lower iodine value. The method is applicable to the purification of liquid fatty acids or raw material for boiled oil, etc.

Deodorized fish oil. KINTARO MITSUI. Japan 37,131, Sept. 21, 1920. Live fishes for manuf. of oil, such as sardine, herring, cod-fish, etc., are boiled during several hrs. with about 0.13% boric acid soln. and then pressed. The oil is sepd. from H_2O and filtered. It is tinged with light yellow color and has no bad odor. The residue is utilized as fertilizer.

Soap free from alkali. NOASABURÔ TSUBAKIMOTO and DAI-ICHI KÔGYÔ SEIVAKU Co. Japan 36,909, Aug. 11, 1920. After the raw material has been saponified by the usual method, 0.2-1% acidic salt soln., such as alkali bicarbonate or Na acid phosphates is added under agitation. Or CO_2 is passed through a pasty or powdered soap, changing free alkali into Na_2CO_3 .

28—SUGAR, STARCH AND GUMS

F. W. ZERBAN

The research and educational requirements of the sugar industry in Mauritius. H. A. THOMPSON. *Bull. soc. chim. Maurice* 12, 14-25(1921).—An address. F. W. Z.

The world-statistic.I position of (beet and cane) sugar. A. BARTENS. *Deut. Zuckerind.* (special number) 1921, 44; *Arch. Suikerind.* 29, 944-55. F. W. Z.

Rational selection of cane cuttings for planting purposes. EMILIEN PASTOR. *Bull. soc. chim. Maurice* 12, 25-7(1921).—Although seedling work is of the greatest importance, the yield of existing varieties can be greatly improved by a careful selection of the tops or stalks used for planting. The seed pieces must be obtained exclusively from plant cane, never from ratoons, and only the best developed ones with sound, vigorous eyes must be chosen. Practical results are cited showing an increase in yield from 17-18 tons per arpent to 26 tons, within 7 yrs. F. W. ZERBAN

The results of sugar beet selection. TH. ROEMER. *Deut. Zuckerind.* (special number) 1921, 39; *Arch. Suikerind.* 29, 1077-82.—Up to about 10 yrs. ago beets were selected in Germany principally according to their sugar content. The possible max. in this direction is now being approached, and selection for high yield per acre is now becoming more and more important. More attention is also being paid to resistance to pests, diseases, and other injurious factors. F. W. ZERBAN

Imbibition. W. P. EBRELS. *Bull. soc. chim. Maurice* 12, 11-8(1921).—Expts. were made to ascertain whether the modern practice of driving the different mill sets with one engine, necessitating close spacing of the sets, has an unfavorable influence

on the effect of the imbibition, as compared to the old method of mill sets placed farther apart and driven by sep. engines. An old type mill with 3 sets was used. In one instance the imbibition water was applied, as usual, to the bagasse leaving the second mill, and the juice from the third mill to the bagasse leaving the first. In a parallel test the water was applied to the bagasse in the feed chute of the third mill, only 4 feet from the mill, and the juice from the third mill to the bagasse in the feed chute of the second mill, again at a distance of only 4 ft. Analyses showed that the first method gave much better results than the second. But the results are not conclusive, because in the first case the maceration liquid was applied to well compacted bagasse, in the second to loosely packed material.

F. W. ZERBAN

The examination of sugar crystals by projection. GEORGE P. MEADE. *J. Ind. Eng. Chem.* 13, 712(1921).—For detg. the size and regularity of raw sugar crystals a Bausch and Lomb balopticon, with special attachment to project a sample placed horizontally in a Petri dish, is used. The sugar crystals are moistened with alc. and are sep'd. by rolling under the fingers. On the screen, which is made from plaster of Paris, several squares are drawn which are subdivided into smaller squares of known dimensions so that the actual size of the crystals can be detd., the magnification being known. Form and regularity of the crystals and any unusual features also are noted and recorded.

F. W. ZERBAN

Sucrose determination in molasses by the Clerget method, using basic lead nitrate and aluminum sulfate as clarifying agents. H. KALSHOVEN AND C. SJILMANS. *Arch. Suikerind.* 29, 989-99(1921).—The object of this investigation was to devise a method of clarification which would furnish a light enough filtrate to avoid errors from diln. and from the use of short tubes. Herles's reagent, consisting of $Pb(NO_3)_2$ and NaOH in equiv. quantities, gives a lighter filtrate than Pb subacetate, but the liquid is still acid, owing to the formation of basic nitrates. By adding more NaOH, without going to the alk. side, the liquid becomes lighter and lighter. The direct polarization increases, but the invert polarization decreases, the sucrose remaining the same. The sucrose found is 0 to 0.5% higher than by the Tervooren method, but it is as yet impossible to say which of the two is more nearly correct. The basic nitrate has the advantage also that the ppt. is insol. in an excess of the reagent. Instead of using $Al(OH)_3$ and $Al(OH)_4^-$, as is usually done, it is better to employ $Al_2(SO_4)_3$. This salt has no effect on the polarization; it ppts. any excess of Pb present, which prevents development of turbidity in the liquid before inversion, and the pptn. of $PbCl_2$ after addition of HCl; $Al_2(SO_4)_3$ also decolorizes better and is simpler to use. The following method is recommended: 35.816 g. molasses are washed into a 250-cc. flask; add 30 cc. $Pb(NO_3)_2$ soln. (600 g. com. salt and 1000 cc. water), shake, then add 30 cc. NaOH soln. of 1.075 sp. gr. at 27.5° (80 g. NaOH dissolved to 1000 cc.), and shake again. Make up to vol. and filter. Pour filtrate into a 100/110-cc. flask to the 100-cc. mark, add satd. $Al_2(SO_4)_3$ soln. almost to 110-cc. mark, fill to mark with water, add a little kieselguhr and filter. Polarize in 400-mm. tube, waiting until liquid for invert polarization is ready. 50 cc. are inverted in a 100-cc. flask according to Herzfeld, Steuerwald, or Walker, 1-2 g. bone black added, the liquid is shaken, filtered and read in a 400-mm. tube. Multiply invert reading by 2, and calc. sucrose from usual formula. With light colored molasses the treatment with $Al_2(SO_4)_3$ may be omitted; 32.56 g. molasses are clarified with 30 cc. each of $Pb(NO_3)_2$ and NaOH soln., and made up to 250 cc. The filtrate is read in a 400-mm. tube, and a part of it inverted as above. If only the apparent purity of a molasses is wanted, only 20 cc. of NaOH must be used instead of 30, because else the direct polarization is found higher than by the method usually employed. A large number of test analyses are given.

F. W. ZERBAN

The comparative values of decolorizing carbons. A. B. BRADLEY. *Intern. Sugar*

J. 23, 455-62(1921); cf. *C. A.* 15, 1415.—In comparing the efficiency of decolorizing carbons it is necessary to adopt a standard method of procedure. For the purpose of color detn. a standard tintometer or colorimeter should be adopted and the Hess-Ives tint-photometer is recommended. As a standard soln. for measuring decolorization B. recommends the one proposed by Thomas (*C. A.* 15, 1637) which is a 50% raw sugar soln. The com. carbon having the highest decolorizing power on the standard soln. should be adopted as the standard carbon. On this basis B. recommends Super Filtchar, 1.6% of which gives as much decolorization on the standard soln. as 5% of Norit. Comparisons, however, should not be made with just one amt. of standard and sample carbon to be tested, but amts. of both should be used varying from 1 or 2 to 5 or 6%, and the results should be plotted as curves to show relative efficiencies. In addition to the comparative decolorizing power the time required for filtration of liquors treated with standard and test carbon should be stated, and a standard method of filtration adopted. In addition to these factors the size of grain should be given in terms of the percentage left on various sizes of screens, and the vol. of carbon for a definite standard wt. should be stated.

W. L. OWEN

The factory rendement for different raw juice purities, according to Winter's formula. J. P. SMITS. *Arch. Suikerind.* 29, 1001-4(1921).—S.'s practical experience has shown that with juices of low purity it is more difficult to obtain the sugar yield indicated by Winter's formula than with juices of high purity. This is due to the fact that the formula implies smaller unknown losses for low purity than for high purity juices. This is contrary to facts, however, as the unknown losses depend more on the factory operation than on the nature of the juice. They are therefore about the same for juices of different nature, or rather even higher for low purity juices. F. W. Z.

Vapor compression in the sugar factory. H. CLAASSEN. *Deut. Zuckerind.* (special number) 1921, 35; *Arch. Suikerind.* 29, 1027-38.—Careful calcns. show that this method of fuel economy is of no or very little value in a well-balanced sugar house, unless the compressor can be driven directly or indirectly by water power. In certain cases the steam injector may however be used to advantage.

F. W. ZERBAN

The significance of recent developments in colloid chemistry. H. R. KRUYT. *Arch. Suikerind.* 29, 1102-6(1921).—This is the résumé of an address pointing out the importance of colloid chemistry in the operations of the beet sugar factory, particularly diffusion, clarification, granulation, and the treatment of after-products. F. W. ZERBAN

The electrification of sugar factories, and the use of centrifugal pumps. BERTHOLD BLOCK. *Deut. Zuckerind.* 46, 479-81(1921).—Experience at the sugar factory Ercsi has shown that the use of a steam turbine and of electrically driven centrifugal pumps requires more power than the old system of steam engines and reciprocating pumps. The motors are very sensitive to moisture and spattered liquor, as well as to varying loads. Centrifugal pumps are indicated where large quantities of liquid are handled in regular vol. and at even pressure. But with frequent pressure changes they are not economical, not even when regulated by valves and cut-offs. An admixt. of as little as 3.75% of air in the suction line entirely stops the lifting effect. Besides, in most factories the personnel is not as well trained for emergency repairs on these pumps as on the old style equipment. Experiences with new forms of machinery should be more widely published, and the existing scientific institutions should be assisted financially to carry on a more intensive study of the engineering side of sugar manuf.

F. W. ZERBAN

Wall paints (for sugar factories). KARL MICKSCH. *Deut. Zuckerind.* 46, 465-6 (1921).—The oil paints formerly used are very expensive and not durable. Masonry walls, exposed to water vapor and chemicals, are best painted with the following mixt.: 6 kg. very fine, sifted lime, and 1 kg. salt are mixed with 4 l. water and heated to boiling. Before this mass gets cold, stir into it 250 g. alum, 100 g. crystd. FeSO_4 , 150 g. K_2CO_3 .

and enough fine, sifted sand that the mixt. can still be applied with the brush. This paint is excellent for ordinary or cement plaster; it does not require as careful prepn of the surface to be painted as is necessary before the application of oil paint. Where black is not objectionable, a lacquer made of high-grade asphalt dissolved in turpentine or benzene is very serviceable and relatively cheap. In certain parts of the factory a waterproof paint is not needed, but only a light colored protecting surface which does not rub off. Lime wash made from high-grade lime is perfectly satisfactory here; if a binder is desired, there may be added small quantities of ox blood, linseed oil, tar, lamp black in alc., or sulfate of Fe, Co, or Cu.

E. W. ZERHAN

The consistency of starch and dextrin pastes. WINSLOW H. HERSCHEL and CARL BERGQUIST. *J. Ind. Eng. Chem.* **13**, 703 (1921). When tested with a modified Bingham and Green plastometer (*C. A.* **14**, 1047; *Bur. Standards, Sci. Paper* **278**), starch and dextrin pastes at the concns. at which they are used were found to be plastic solids. The *body, spreading capacity, and setting power* of the different samples were indicated by the differences in the yield, shear values and rigidities detd. by this method.

WM. STERICKER

The rare sugars; their purity and tests. (FANSTEIN, BLACK) **7**. Standardization of the rare sugars (GRABER) **7**. Handling sugar refinery wastes (PEARSE, *et al.*) **14**. The saccharoractometer (DILG) **11B**.

MIKUSCH, GUSTAV: *Die Zuckerindustrie, ihre Lage im alten Oesterreich während des Weltkrieges und ihre Aussichten in Deutschösterreich.* Leipzig: Verlag Wilhelm Frick. G.m.b.H. 30 pp. For review see *Deut. Zuckerind.* **46**, 515 (1921).

29—LEATHER AND GLUE

ALLEN ROGERS

Chrome tanning. III. Mechanism of the neutral salt effect. DONALD BURTON. *J. Soc. Leather Trades' Chem.* **5**, 183-6 (1921); cf. *C. A.* **15**, 1230.—It is concluded that the neutral salt effect is a function of: (1) deceleration of penetration by a blocking action of the neutral salt; (2) changes in swelling due to the combined effects of the acid and neutral salt present; (3) retardation of (a) penetration of Cr due to an increase in the acid taken up by the pelt, with consequent production of a more basic chrome salt which would have a lower rate of diffusion, (b) ptn, due to an increase in the acidity of the pelt, which would involve a longer time for neutralization and consequently a further retardation of tanning. **IV. The influence of neutral salts on the absorption of the acid and chromium from chrome solutions by gelatin.** DONALD BURTON and ARTHUR GLOVER. *Ibid* 187-92.—The object of the authors in the present paper is to investigate experimentally several factors, one or more of which may be functions of the possible influences of neutral salts on each of the stages of chrome tanning and the retardations produced by these salts. The expts. are described in detail and lead to the tentative conclusions that (1) neutral salts decrease the diffusion of the Cr and the order of retardation is the same as that of the degree of hydration; (2) neutral chlorides cause an increase in the amt. of acid taken up by the pelt, while sulfates cause a decrease; (3) double-salt formation, as far as can be judged, seems to have very little influence on the rates of diffusion; (4) the swelling may be greater in chrome solns. than in H_2O , but the effect of adding neutral salts is to diminish this, though to an extent which renders it of minor importance insofar as the rate of tanning is concerned. **V. A further aspect of the neutral salt effect.** DONALD BURTON. *Ibid* 192-8.—Pptn.-point detns. with violet and green chrome alum solns., also a comparable chromium sulfate soln.,

are described with the object of making clear the cause of the rise occasioned by neutral salts. Because of several complications, the only certain conclusion possible was that sulfates cause a greater increase in pptn. point than chlorides. Further expts. are in progress.

H. C. PARISH

Tanning gelatin with formaldehyde. W. MOELLER. Hamburg. *Kolloid-Z.* 29, 45-55(1921); cf. *C. A.* 15, 190.—When gelatin and HCHO solns. were mixed only a part of the gelatin coagulated. The quantity of gelatin in the soln. capable of being tanned corresponded to this coagulated portion. When the latter was decreased by hydrolysis in consequence of the action of H^+ , the amt. tanned diminished accordingly. The HCHO reacted with the gelatin not coagulated to form methylene amino acids. The tanning constituent of the HCHO is the insol. polymers which form chiefly during the action on the gelatin. Exptl. results gave no information concerning a quant. relation between the amt. of HCHO taken out of the soln. and the tanning.

H. M. McLAUGHLIN

The determination of tannin. JOHN ARTHUR WILSON AND ERWIN J. KERN. *J. Ind. Eng. Chem.* 13, 772-4(1921).—Tannin is detd. by measuring the increase in wt. of dry hide powder after using to detannize the soln. for analysis and subsequently washing out the nontannins. This modification of the authors' new method (cf. *C. A.* 14, 2103; 15, 327) results in a great saving of time and labor and tends towards increased accuracy. A special washing device is described. Objections raised against the new method are refuted and it is shown that the principle underlying the present official method is unsound. In using the new method with syntans, it is suggested that the tanned powder be washed first with salt water until the acid is removed and then with distd. water.

J. A. WILSON

The analytical determination of basicity figures. JAMES E. PICKERING. *J. Soc. Leather Trades' Chem.* 5, 177-83(1921).—The difficulty in obtaining correct and concordant results for the acidity of one-bath chrome liquors may be attributed to several causes, all of which tend to affect or obscure the final end-point. The following method has been devised to overcome these difficulties: 5 cc. of a 1% phenolphthalein soln. are added to a soln. of 25 g. NaCl in 200 cc. distd. H_2O . It is neutralized if necessary, brought to boiling and again neutralized if necessary. 25 cc. of chrome liquor, contg. preferably 0.15-0.25% Cr_2O_3 , are added, and the whole is brought to boiling and titrated with 0.1 N NaOH. The beaker is placed upon a white tile on the buret stand, immediately behind which and a little at the left, is a 0.5-w. lamp covered with an opal shade. The alkali is run in at a steady rate with frequent shaking. As the end-point is approached, the liquid assumes a distinct light blue color, as the pptd. basic chromium sulfate coagulates. Alkali is added, slowly, until a yellowish pink color when viewed against the lamp shade indicates the end-point. After the ppt. has settled the soln. should be pink. A method for detn. of chromium is given, which consists briefly in oxidation with Na_2O_2 to dichromate, addition of KI soln. and titration of the liberated I. Precautions are discussed in detail.

H. C. PARISH

Artificial leather from cordite. ANON. *Chem. Met. Eng.* 25, 528(1921).—Investigations have so demonstrated the suitability of cordite for use in the manuf. of leather that 35,000,000 lbs. of the surplus cordite has been purchased from the British Govt. and a plant erected at Highland Park with a daily output of 25,000 sq. yds. for the Ford Motor Co.

CHARLES E. MUNROS

***Some experiments in the use of antiseptics in the manufacture of glue and gelatin.** GILBERT J. FOWLER, KALYAN C. SRINIVASAN AND V. S. CHINNASWAMI. *J. Indian Inst. Sci.* 4, 107-18(1921).—The work represents an attempt to det. the reaction of gelatin liquors least favorable for the propagation of bacteria. The methods employed to det. the rate of disintegration of gelatin by acids or bacteria were (1) noting the de-

crease in vol. of ppt. formed by tannic acid; (2) decrease in viscosity; and (3) decrease in time required for the jelly to melt after being taken from a cold incubator. Adding 0.01 mole HCl per l. gelatin soln. gave the optimum reaction for the growth of liquefying organisms. The greatest inhibitive action was obtained by adding 0.02 mole HCl or 0.003 mole H_2SO_4 per l. and the combined effect of both acid and bacteria was least at these reactions, while 0.002 mole of SO_2 per l. proved equally effective. 0.06 part of $HCHO$ per 100 of gelatin was the minimum capable of stopping bacterial action. Growth of molds can be stopped by concg. gelatin solns. to 40% or over. The use of SO_2 is recommended to give the desired reaction to gelatin solns. because of its low cost and its antiseptic, clarifying and decolorizing effects. Apparently no H-ion concns. were detd.

J. A. WILSON

The determination of sulfurous acid in animal glue. A. GUTDIER, E. SAUER AND H. BRINTZINGER. *Kolloid-Z.* 29, 130-9 (1921).—Bone glue is usually acid, and demands different methods than hide glue, which is usually neutral or alk. With bone glue total acidity is easily detd. by direct titration with 0.1 N NaOH, phenolphthalein or rosolic acid being used as indicator. H_2SO_3 is then detd. by titration with 0.1 N I soln. The difference is mainly H_2SO_4 . It may be checked by titration with 0.1 N NaOH, alizarin being used as indicator, which, in the presence of at least 1% of glue, has the curious property of acting only on strong acids and not on H_2SO_3 . Since none of the hide glues tested showed this relation between H_2SO_3 and total acidity, it serves to distinguish between hide and bone glues. Hide glues often contain CH_2O and other substances that react with I soln. They are, therefore, acidified with H_3PO_4 , the combined SO_2 is distd. off in a current of steam or CO_2 , caught in I soln., and weighed as $BaSO_4$. After elimination of SO_2 , if CH_2O is present added fuchsin- H_2SO_3 produces a violet coloration. Mixts. of bone and hide glues are treated as hide glues. JEROME ALEXANDER

Finishing leather. W. H. MEADE and S. H. FRIESTEDT. U. S. 1,385,184, July 19. Leather is coated with a mixt. of wax, borax, shellac, casein and Se in order to equalize the color of light grained surfaces. Se, Te, Sb and graphite also may be used together for the same purpose.

30—RUBBER AND ALLIED SUBSTANCES

JOHN B. TUTTLE

Syntheses of rubber. I. I. L. KONDAKOV. *Caoutchouc & gutta-percha* 18, 10990-94 (1921).—The first installment of a historical survey of research and of developments in the several processes for synthesizing rubber (cf. Dubosc and Luttringer, *Le Caoutchouc, sa chimie nouvelle, ses syntheses*, p. 427). No process is considered hopeful commercially except that of methyl-rubber from dimethylbutadiene (A). This is chiefly because it is the only process utilizing cheap raw material. K. claims priority over Harries, Matthew, Aschan and the Bayer Co. in synthesizing rubber from A by means of Na, basing his claim on expts. described in *J. prakt. Chem.* 62, 175; 64, 109.

C. C. DAVIS

Dryness of plantation rubber. H. P. STEVENS. *Bull. Rubber Growers' Assoc.* 3, 340-2 (1921); cf. *C. A.* 15, 962.—Four samples were compared with respect to (a) viscosity of a C_6H_6 soln. of the raw rubber, (b) time required for mastication on the mill, (c) viscosity after mastication, (d) quantity of a mineral compounding ingredient (China clay) capable of being incorporated and time required for such incorporation. One of the samples which showed an exceptionally low figure for a also showed low figures for b and c; but among the other samples no regular relation was apparent between a on the one hand and b and c on the other hand. There was no apparent relation be-

tween *b* and *d*; *i. e.*, between the ease with which the rubber was broken down and the "dryness or ease with which rubber took up a finely divided mineral ingredient."

C. S. WHITBY

Comments on the cultivation and the development of Hevea. E. DE WILDEMAN. *Caoutchouc & gutta-percha* 18, 10801-6 (1921).—The production and acreage of Plantation, S. American and African rubbers are discussed (cf. *India Rubber J.* 60, 623 (1920)). A detailed survey follows of the relative merits of the various systems of tapping, of the methods of spacing and drainage, and of similar problems of cultivation. This is in effect a discussion of the development work of Devraigne (*Bull. économique de l'Indochine* 1910, no. 142); Vernet (*Bull. Agr. Inst. Sci. de Saigon* 1920, p. 227); Petch (*Ned. Ind. Rubber Tijdschrift* 1920, no. 11, 362 and *Algemeen Landbouwweekblad voor Ned. Ind.* no. 10, 226); van Uffelen (*Algemeen Landbouwweekblad voor Ned. Ind.* 1920, no. 7, 146); Hamaker (*Ibid* 1920, no. 52, 1498) and van Baeten (*Ibid* 1920, no. 14, 31). The most advantageous complete system of culture is still in dispute. In reality the most economical balance between max. yield and max. life depends upon the locality and climate (cf. *Tropical Agriculturist* 1920, Sept., 154 and *Malayan Tin and Rubber J.* 9, 13).

C. C. DAVIS

Sols and gels of vulcanized rubber. HENRY P. STEVENS. *J. Soc. Chem. Ind.* 40, 186-90T (1921).—Vulcanized rubber swells in solvents but at moderate temps. the gel does not disperse in any excess of solvent. A vulcanized sol can however be obtained by heating a raw rubber sol with S or by treatment with S_2Cl_2 . The sols on spontaneous evapn. give gels of vulcanized rubber which cannot be dispersed to sols in any solvent. Raw rubber with 10% S dispersed in $C_6H_5Me_2$ and heated in an oil bath (no temp. given) 2-3 hrs. forms 2 phases, a liquid and a gel. Upon evapn. the gel is found to be vulcanized whereas the rubber from the liquid has a very low vulcanization coeff. By heating rubber and S under pressure with C_6H_6 at the same temp. as before, a homogeneous vulcanized sol results. Above a definite rubber concn. a vulcanized gel is obtained. The viscosity of the vulcanized sol increases rapidly at first. Conversion from sol to gel can be effected by exposure to light. The gel reverts to a sol in the dark and in many cases this reversible reaction can be repeated. But by long exposure liquefaction and loss of viscosity take place. While still warm a vulcanized sol can be dried indefinitely. The vulcanized sol on aging gradually becomes extremely viscous and if evapd. at room temp. a gel is obtained which cannot be dispersed. This gel exhibits the familiar aging characteristics of cured rubber but is more sensitive to light. Like dry rubber the rate of combination of rubber sol and S is a function of time, temp., % S, accelerator, etc., and unlike dry rubber is a function of the concn. and the specific solvent. Gels of inferior quality can be obtained by curing sols with $C_6H_5(NO_2)_3$ + PbO . The time of gelation of vulcanized sols from S_2Cl_2 and rubber is a function of the S_2Cl_2 -rubber ratio, and by diminishing this ratio sols are obtained which do not gel (cf. Porritt, *The Rubber Industry* 1914, 168). Vulcanization of dil. sols does not affect materially the viscosity. This is attributed to (1) the small decrease in viscosity of the sol due to heating and (2) hysteresis effects. By heating a raw rubber sol with or without S there is an initial decrease in viscosity in each case, followed by a rise and subsequent decrease when S is present, and a progressive decrease without S. The rate of vulcanization of a 10% sol is approx. 0.5 that of a dry mixt., and the rate is asymptotic to that of the dry mixt. as the concn. increases. The rate of vulcanization in different solvents varies from the fastest to the slowest as follows: $PhMe$ (A), $C_6H_5Me_2$, pseudocumene, $PhCl$, $CHCl_3$, petroleum ether, C_6H_6 , $(CH_2Cl)_2$ and Cl_2HCCH_2Cl (B). The rate in A is approx. twice that in B.

C. C. DAVIS

The modulus of hardness of vulcanized rubber. H. P. GURNEY. *J. Ind. Eng. Chem.* 13, 707-12 (1921).—The modulus of hardness of rubber is the ratio of the force

applied to produce a depression to the vol. of the depressions produced. It may be most satisfactorily ascertained by use of an instrument of the dead-weight type, such as the plastometer. As the instrument is generally employed, the dial reading is taken after a load of 1000 g. has been acting for 60 secs. to depress into the rubber sample a point consisting of a steel ball, 0.125 in. diam. If d is the extent to which the point is depressed (1 dial division = depression of 0.01 mm.), and r the radius of the ball, the vol. of the depression is $\pi d^2(r - d/3)$. The apparent hardness in dynes per cc. can be estd. approx. by dividing 2.75×10^{11} by the plastometer reading. Data referring to two samples, of plastometer readings 110 and 40, resp., show that the relation between force and vol. of depression is almost linear (and hence the modulus is almost const.), except in the vicinity of the origin, for forces up to 1,000,000 dynes. Data are given showing the influence on the figure for hardness of (a) the time for which the force acts, (b) the temp., (c) the thickness of the slab. The rate at which the plastometer reading increases with time is not the same with all rubber samples. Stocks of a hardness of 5×10^8 dynes per cc. tend to be least affected in hardness by temp. changes. As the thickness of the slabs tested increases, the hardness asymptotically approaches a limit, in the examples shown, at a thickness somewhat greater than 1 cm. In general, hardness increases with (a) increase in the S/rubber ratio, (b) decrease in the rubber content, (c) increase in the vulcanization period; but in some cases the modulus shows a diminution with increase in the vulcanization period. Some graphs relative to these conclusions are shown. (The data given concerning the compn. of the compds. to which the graphs refer are incomplete.—ABSTR.) The practical application of the hardness const. to the design of rubber-covered rolls is discussed.

G. S. WHITBY

The acceleration of vulcanization by organic accelerators. II. A. MAXIMOV. *Caoutchouc & guita-percha* 18, 10986-8(1921); cf. *C. A.* 15, 3412.—Powerful accelerators are arbitrarily classed as those which diminish at least 100 times the time of cure. On this basis neither piperidine nor the secondary amines and their thiuram sulfides or disulfides can be so classified. But the Zn and Pb salts of these compds. are among the powerful accelerators. By fusing tetramethylthiuram sulfide (A) or disulfide (B) with ZnO ($\text{Me}_2\text{NCSS})_2\text{Zn}$ (C) is formed, clear rose-colored needles, m. 243–5°, sparingly sol. in EtOH , C_6H_6 and CHCl_3 . But by fusion of A or B with alk. earth oxides the salt first formed decomposes as follows: $(\text{Me}_2\text{NCSS})_2\text{Ca} \rightarrow (\text{Me}_2\text{N})_2\text{CS} + \text{CaS} + \text{CS}_2$. This shows why MgO and CaO do not, like ZnO , increase the activity of the thiuram. The aromatic derivs. of thiuram disulfides decompose when gently heated (*Ber.* 33, 2726) and so are not active accelerators. For instance the rubber compd. 100 rubber, 3.5 S, 0.5 diphenylthiuram disulfide neither with nor without ZnO or PbO would cure in 15 min. at 30 lbs. Three rubber compds. show the activity of C: (1) 100 rubber, 3.5 S, 0.5 C, no cure in 15 min. at 30 lbs.; (2) 100 rubber, 3.5 S, 2 ZnO , 0.5 C, complete cure with no bloom afterward at the same cure; (3) 100 rubber, 3.5 S, 2 C, complete cure with no subsequent bloom in 20 min. at 30 lbs. It is considered that the acidity of the rubber resin accounts for the difference between the results of (1) and (3). The Pb salt acted similarly. By this procedure the Zn and Pb salts of the addition products of piperidine; Et_2NH , Et_2NH , diisobutylamine, diisoamylamine and $\text{C}_4\text{H}_9\text{CH}_2\text{NHEt}$ were classed as powerful accelerators. Fusion of the amine deriv. with ZnO and S and extn. with CHCl_3 or CS_2 yielded more active compds. than the mode of prepn. described above. The cause was not detd. The surface tension of S was found to be lowered considerably by the presence of 2% of C. To minimize premature deterioration the sulfur-rubber ratio must be controlled very closely with powerful accelerators. 1.5% of S to rubber gave good results. By means of accelerators of the type described the temp. of cure has been lowered to 100–5° (Maximov, Russian patent 70011). Cements are made in 2 parts, (1) rubber and S, (2) rubber, ZnO and accelerator. By mixing and heating to

100° cure is complete in a few min. Similarly by using 6-8% of S and 10-20% of ZnO, mixts. can be cured at ordinary temps. after some hrs.

C. C. DAVIS

Influence of certain organic accelerators on the vulcanization of rubber. G. S. WARRBY AND O. J. WALKER. *J. Ind. Eng. Chem.* 13, 816-9 (1921).—The effects of 1 part of piperidine piperidylidithiocarbamate on the vulcanization of a 90:10 rubber-S mixt. are (a) to multiply by about 7 the rate at which optimum tensile properties are reached, (b) to increase notably the tensile strength attainable, (c) to reduce somewhat the extensibility and lead to a lower position of the stress-strain curve (strains as ordinates) at the optimum cure, (d) to diminish somewhat the S coeff. at the optimum cure. One part of hexamethylenetetramine increases the rate of cure of the same mix by about 50%. Its effects stand in contrast in several ways with the effects of the piperidine compd. It increases the extensibility and leads to a higher position of the stress-strain curve at the optimum cure; it leads to a flat curing max.; it increases somewhat the S coeff. at the optimum cure. One part of thiocarbamide is without accelerating effect on the vulcanization of the mix in question. It increases, however, the S coeff. at the optimum cure. In an aging test of 7-mos. duration, the accelerators in question are without effect on the aging of pure gum vulcanizates.

G. S. W.

Cellular rubber. K. H. FULTON. U. S. 1,385,044, July 19. Cellular rubber is prepd. by treating a rubber compn. with N or other gas under pressure to effect occlusion of the gas, vulcanizing the material while subjected to the gas pressure, allowing it to cool and then heating it to cause the occluded gas to be discharged. Activated charcoal is used to promote the gas absorption.

Rubber composition. A. NIXON. U. S. 1,384,400, July 12. A vulcanized mixt. of rubber 10 and vulcanized fiber 20 parts is used for the manuf. of shoe heels, packing rings or other articles.

Utilizing vulcanized waste rubber. S. B. MOLONY. U. S. 1,384,773, July 19. Soft vulcanized rubber contg. fabric is treated with S to impregnate the fabric associated with the rubber and the material is heated to effect a semi-hard vulcanization of the mass.

Rubber wash-cloth. P. D. STRALE and A. E. SIDNELL. U. S. 1,384,871, July 19. Wash-cloths of rubber are prepd. by subjecting a sheet of creped rubber to the dissolving and curing actions of a soln. of C_6H_6 and S. chloride. The material is washed with NH_4OH soln.

